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# RESEARCH REGARDING THE GRAIN COMPLIANCE IMPORTANCE ON THE QUANTITY OF FLOUR OBTAINED BY GRINDING

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***Abstract:*** *The paper presents the influence of technological equipment quality wheat conditioning prior to milling by removing foreign bodies, debarking and wetting the percentage of flour made from wheat ground. The version I use a line conditioner to older technology, and the version II equipped with modern technical equipment. It is noted that the percentage of flour obtained, so that the overall and for the most common categories of the flour (F450, F650 and F1350) is greater than the version II compared to the version I, as debarking is better, and the humidification is very accurate [3]. Also, ash content and specific energy consumption are more favorable version II.*
***Keywords:*** *wheat conditioning by humidification, percentage of meal energy consumption.*

## 1. INTRODUCTION

The technology of milling wheat must ensure as high a percentage to obtain a high-quality flour, as well as the optimum specific energy consumption[6]. Of quality indicators of wheat flour in this paper were taken into account the ash content and the amount of flour extracted from the raw material and economically determined the specific consumption of electricity [3]. The quantity of flour obtained, the amount of ash and specific energy consumption is required, or stop the optimization calculation, because the increase in the percentage of flour needs to increase the number of passages of grinding and screening, which leads to an increase in the specific consumption of energy per tonne of wheat ground [7]. By upgrading technology to remove foreign bodies, peel and humidification can improve these indicators simultaneously, provided that the equipment used for grinding and sieving continue to be upgraded [1],[5].

## 2. MATERIAL ŞI METODĂ

The object of experimental research was the common wheat variety **Apulum** grain reddish or yellowish, oval, with long beards and visible. From the point of view of the degradation of this kind fall into class A, Group I, weight per storage volume greater than 75, impurities content less than 6% and less than 15% moisture. Samples were taken from the same point of the technological process. To highlight the influence of technical equipment used in the conditioning of wheat on technical and economic results obtained after milling were used two production lines, which will be called *variants.* By variant I were used: a volumetric dispenser; table type densimeter MD; debarking type DD 714; tarar Magheru a type; BT selector battery type 8; simple screw conveyor type humidifier bunk; a cascade of aspiration. In the variant II embodiment were used: SDT type dispenser weight; SRD double rotational type separator; intensive debarking type SPO; TCR recirculation channel type; stone separator type SPT; Agromatic intensive type humidifier [2]. Every technological variant were taken every 6 samples, which were determined ash content was applied peeling I was determined again ash content; humidification I was performed after the wheat was allowed to rest for homogenisation moisture. Next step was done peeling II was determined ash content of the six samples was checked and corrected moisture, then enter the grinding wheat. In addition to the amount of ash of the two types of samples were measured amounts of flour and all kinds F 480, F 650 and F 1350, a percentage of the amount of wheat powder, obtained

by applying the two types of technology conditioning of wheat before milling. Also, there was energy use and specific energy consumption was calculated in the two technological variants [4].

## 3 RESULTS AND DISCUSSION

Particular attention during the measurements was given moisture content of the grain mass.
In Table 1 and Figures 1 and 2 is the moisture content of the wheat meal, by gross wheat and by wheat neto wheat.

**Table 1:** The moisture content of the wheat meal gross

| Sample | Wheat moisture bruto,% | Wheat moisture neto,% | Sample | Wheat moisture bruto,% | Wheat moisture neto,% |
|---|---|---|---|---|---|
| A1 | 11.77 | 14.84 | B1 | 11.74 | 15.10 |
| A2 | 12.19 | 15.04 | B2 | 12.60 | 15.08 |
| A3 | 11.17 | 14.92 | B3 | 13.50 | 15.10 |
| A4 | 11.78 | 14.99 | B4 | 12.40 | 15.10 |
| A5 | 11.20 | 14.50 | B5 | 13.40 | 15.10 |
| A6 | 11.55 | 14.70 | B6 | 12.92 | 15.09 |

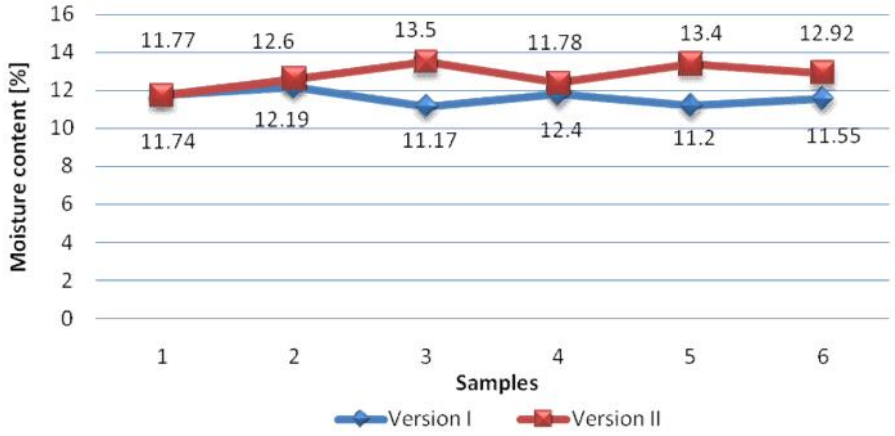


**Figure 1:** Wheat moisture bruto variation

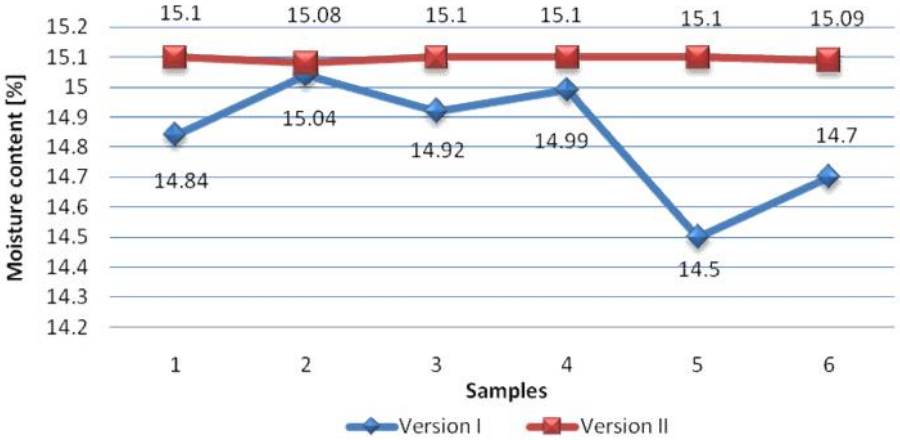


**Figure 2**: Wheat moisture neto variation

Following the measurements and data processing resulted in the following:

- desired humidity in both versions was 15.1%;
- moisture content in the version I prior to the introduction went between 11.17-12.19%;
- moisture content version II ranged before placing the wetting between 11.74-13.50%;
- moisture wheat content version I ranged between 14.50-15.04% by neto wheat;

- moisture wheat content version II ranged between 15.08-15.10% by neto wheat;
- average moisture content was 14.83% in the version I;
- average moisture content was 15.095% in the version II;
- version II can find a constant humidification resulting values around 15.1%.

After entering the grinding economic indicators were:

- o the quantity of total flour;
- o the quantity of flour in three types: F 480, F 650 and F 1350;
- o the total ash content;
- o the ash content of each type of flour.

Table 2 shows the values of the quantities of ashes and the quantity of flour obtained in version I and in Table 3 the values obtained in the version II. Figure 3 presents the quantity of flour total and is shown in Figure 4 compared to the average value of the amount of flour obtained, as a percentage of milled wheat.

**Table 2:** Variation in ash content and the amount of flour (version I)

| Sample | Ash wheat neto, % | Flour total | | Flour 480 | | Flour 650 | | Flour 1350 | |
|---|---|---|---|---|---|---|---|---|---|
| | | % | Ash, % | % | Ash % | % | Ash, % | % | Cenuşa % |
| A1 | 1.90 | 75.68 | 0.71 | 0.00 | 0.00 | 69.00 | 0.65 | 6.68 | 1.35 |
| A2 | 1.88 | 73.03 | 0.66 | 11.42 | 0.48 | 58.00 | 0.65 | 3.61 | 1.35 |
| A3 | 1.89 | 74.78 | 0.69 | 7.65 | 0.48 | 61.38 | 0.65 | 5.75 | 1.35 |
| A4 | 1.92 | 74.84 | 0.71 | 10.00 | 0.48 | 55.98 | 0.65 | 8.86 | 1.35 |
| A5 | 1.99 | 74.77 | 0.72 | 10.01 | 0.48 | 54.62 | 0.65 | 10.14 | 1.35 |
| A6 | 1.94 | 74.77 | 0.70 | 11.89 | 0.48 | 54.21 | 0.65 | 8.64 | 1.35 |
| Media aritmetică | | 74.645 | 0.698 | 8.495 | 0.480 | 58.865 | 0.650 | 7.280 | 1.350 |

**Table 3:** Variation in ash content and the amount of flour (version II)

| Sample | Ash wheat neto, % | Flour total | | Flour 480 | | Flour 650 | | Flour 1350 | |
|---|---|---|---|---|---|---|---|---|---|
| | | % | Ash, % | % | Ash % | | | % | Ash, % |
| B1 | 1.80 | 76.5 | 0.68 | 0 | 0.00 | 72 | 0.64 | 4.5 | 1.30 |
| B2 | 1.79 | 76.0 | 0.67 | 10 | 0.46 | 60 | 0.64 | 6.0 | 1.28 |
| B3 | 1.75 | 77.0 | 0.66 | 12 | 0.46 | 58 | 0.62 | 7.0 | 1.35 |
| B4 | 1.75 | 77.0 | 0.65 | 10 | 0.46 | 62 | 0.63 | 5.0 | 1.30 |
| B5 | 1.74 | 77.4 | 0.65 | 9 | 0.47 | 63 | 0.62 | 5.4 | 1.30 |
| B6 | 1.68 | 76.5 | 0.62 | 10 | 0.47 | 63 | 0.60 | 3.5 | 1.31 |
| Media aritmetică | | 76.733 | 0.652 | 8.5 | 0.464 | 63 | 0.625 | 5.233 | 1.307 |

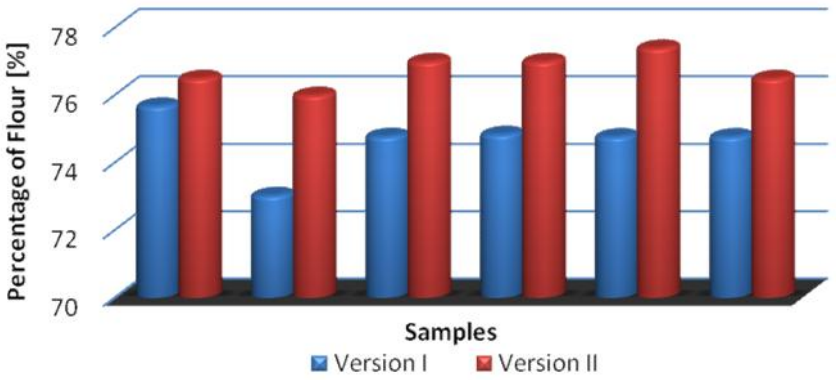


**Figure 3:** The amount of flour total in the two versions

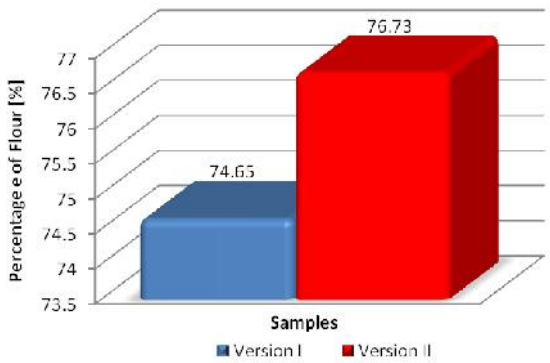


**Figure 4:** The average amount of flour total in the two versions

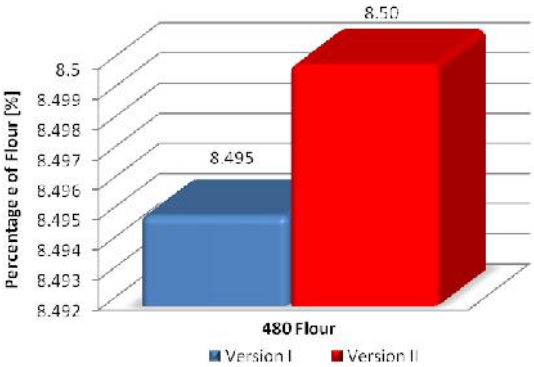


**Figure 5:** The average amount of flour type 480 in the two versions

According to the values listed in Tables 2 and 3, as well as the graphical representations in Figures 3 and 4 results in the following:

- the quantity of flour total in the version I ranged from 73.03-75.68% of the total amount came to the milling of wheat;
- the quantity of flour total average of the 6 samples taken into account in the version I is 74-65.5% of the total quantity came to the milling of wheat;
- the quantity of flour total of the version II embodiment varied from 76-77.40% by weight of the total grain milling entered;
- the average cantity of flour total of the 6 samples taken into account in the version II is 76.733% of the total quantity came to the milling of wheat;
- the total quantity of flour obtained from the milling was higher in each of the samples studied for use in the machine of the Version II;
- the maximum quantity of flour obtained when using the version I is less than the lowest quantity of flour obtained when using the version II.

Increasing the quantity of flour extracted is found in the three types of flour made and analyzed.
Figure 5 shows the average value of the quantity of flour type 480 obtained for the two technological variants conditioning, and in Figures 6 and 7 are the average values of the quantities of flour type 650 and type 1350 obtained for the two variants.

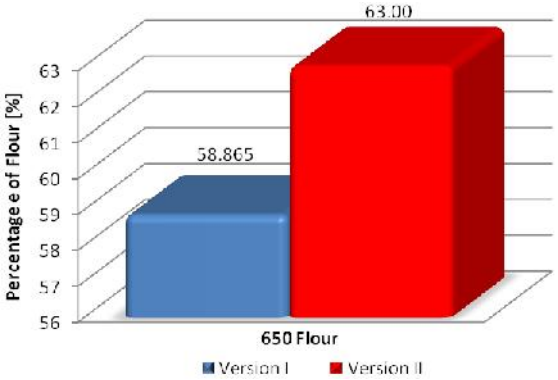


**Figure 6:** The average quantity of flour type 650 in the two versions

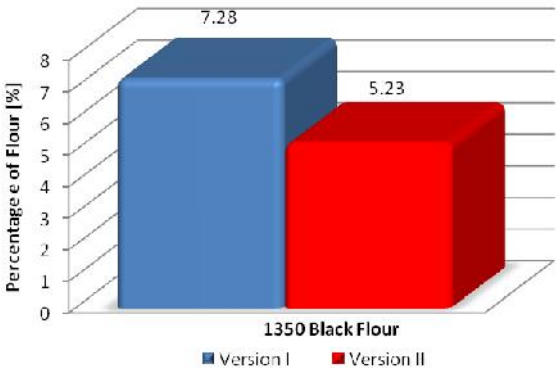


**Figure 7:** The average quantity of flour type 1350 in the two versions

The analysis results presented in Tables 1 and 2 and as graphical representations in Figures 5, 6 and 7 shows the following:

- the quantity of flour type 480 obtained in version I varied between 7.65-11.89% of the total quantity came to the milling of wheat;
- the quantity of flour type 480 obtained in version II varied between 9.00-12.00% of the total quantity came to the milling of wheat;
- the quantity of flour type 650 obtained in version I varied between 54.21-69.00% of the total quantity came to the milling of wheat;

▪ the quantity of flour type 650 obtained in version II varied between 58.00-72.00% of the total quantity came to the milling of wheat;

▪ the quantity of flour type 1350 obtained in version I varied between 3.61-10.14% of the total quantity came to the milling of wheat;

▪ the quantity of flour type 1350 obtained in version II varied between 3.50-7.00% of the total quantity came to the milling of wheat;

▪ increasing the average quantity of flour type 480 of 8.495% into version I at 8.50% in version II;

▪ increasing the average quantity of flour type 650 of 58.865% into version I at 63,00% in version II;

▪ decreasing the average quantity of flour type 1350 of 7.28% into version I at 5.23% in version II;

Another indicator was watching all sorts ash content of flour obtained. Based on the data presented in Tables 1 and 2, Figure 8 shows the average ash content of the flour obtained from the total, and Figures 9, 10 and 11 is shown ash content for each type of the flour produced.

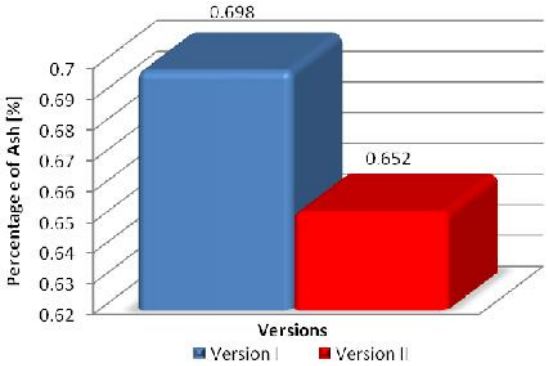


**Figure 8:** The average content of ash in the flour total in the two versions

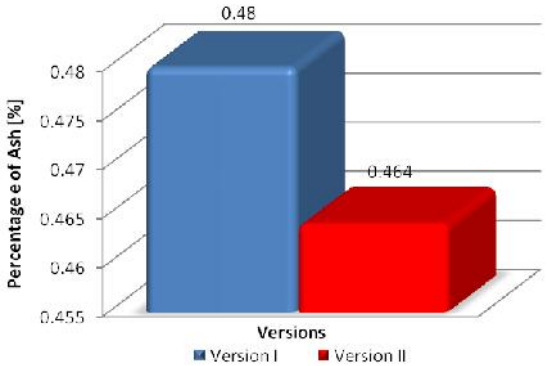


**Figure 9:** The average ash content of the flour type 480 in the two versions

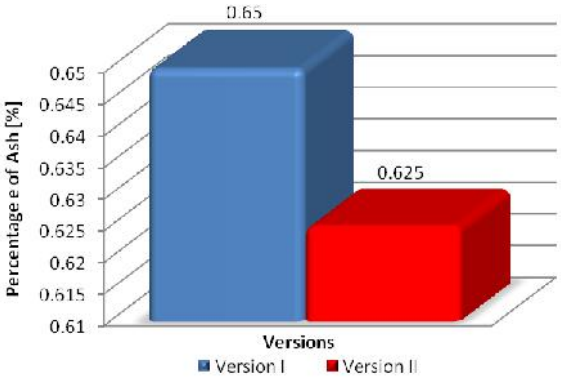


**Figure 10:** The average ash content of the flour type 650 in the two versions

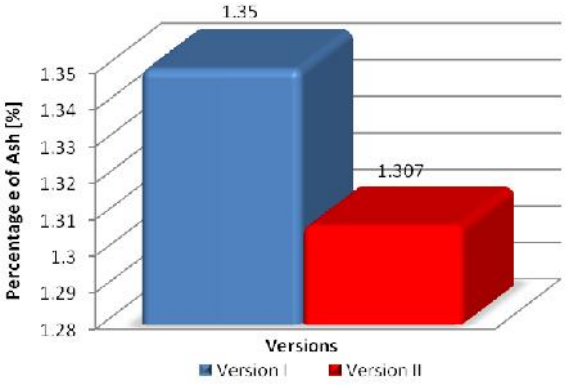


**Figure 11**: The average ash content of the flour type 1350 in the two versions

Analyzing the results presented in Tables 5 and 6 according to graphic representations in Figures 14, 15, 16 and 17 shows the following:

- the ash content of flour total in version I ranged between 0.66-0.72%;
- the ash content of flour total in version II ranged between 0.62-0.68%;
- the ash content of flour type 480 in version I was constantly, respectively 0.48%;
- the ash content of flour type 480 in version II ranged between 0.46%-0.47%;
- the ash content of flour type 650 in version I was constantly, respectively 0.65%;
- the ash content of flour type 650 in version II ranged between 0.60%-0.64%;
- the ash content of flour type 1350 in version I was constantly, respectively .35%;
- the ash content of flour type 1350 in version II ranged between 1.28%-1.35%;

***Specific energy consumption*** for milling were determined for the samples analyzed are shown in Table 4 and Figures 12 and 13.

**Table 4:** Specific consumption of electric energy

| Version I | Specific consumption, kW/t | Quantity flour total, % | Version II | Specific consumption, kW/t | Quantity flour total, % |
|---|---|---|---|---|---|
| A1 | 78.23 | 75.68 | B1 | 79.20 | 76.50 |
| A2 | 82.76 | 73.03 | B2 | 80.50 | 76.00 |
| A3 | 81.60 | 74.78 | B3 | 78.12 | 77.00 |
| A4 | 75.50 | 74.84 | B4 | 77.85 | 77.00 |
| A5 | 78.80 | 74.77 | B5 | 77.45 | 77.40 |
| A6 | 77.8 | 74.77 | B6 | 78.25 | 76.50 |
| **Average** | **79.38** | **74.65** | **Average** | **78.56** | **76.73** |

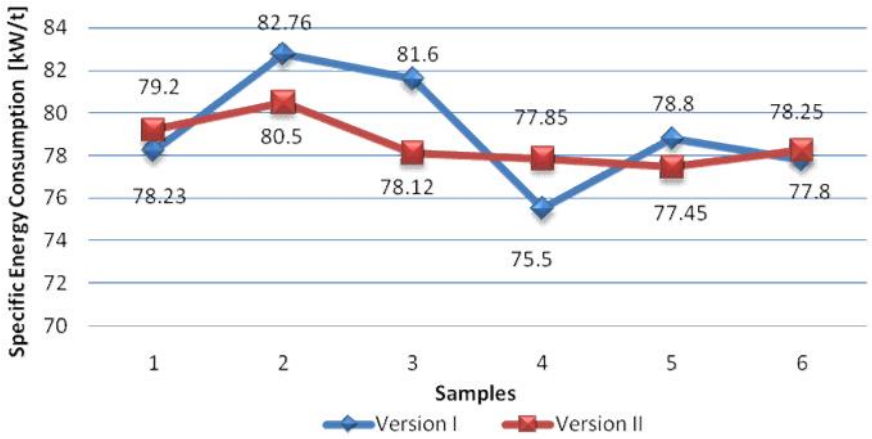


**Figure 12:** The variation of specific energy consumption in the the two versions, for the 6 samples

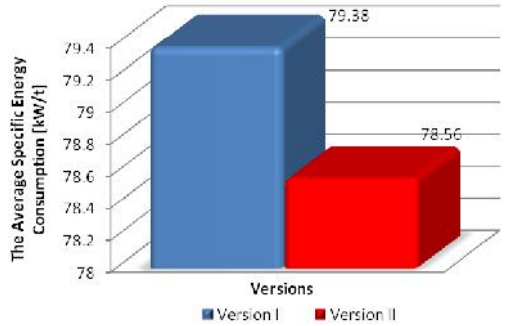


**Figure 13:** Average specific of electric energy consumption in the two versions

## 3. CONCLUSION

1. Use of a wetting system of the version II has resulted in a much greater uniformity in the percentage of moisture; humidity in version I ranged between 14.50-15.04% by neto wheat and version II of humidity ranged between 15.08-15.10%.
2. Due to ensure an almost constant humidity on one hand, and on the other hand, to improve the conditioning process by removing the grain mass of a much larger fraction of foreign bodies, as well as a considerable reduction of the ash content of the two steps of debarking, and good results have been marked in the milling, such as:

- o the average quantity of flour total increased from 74.655% by version I to 76.733% in the version II;
- o the average quantity of flour type 480 increased from 8.495% by version I to 8.50% in the version II;
- o the average quantity of flour type 650 increased from 58.865% by version I to 63.0% in the version II;
- o the average quantity of flour type 1350 decreased from 7.28% by version I to 5.23% in the version II;
- o the average quantity of ash of flour type 480 decreased from 0.48% by version I to 0.464% in the version II;
- o the average quantity of ash of flour type 650 decreased from 0.65% by version I to 0.625% in the version II;
- o the average quantity of ash of flour type 1350 decreased from 1.35% by version I to 1.307% in the version II;

- the average quantity of ash of flour total decreased from 0.7% by version I to 0.652% in the version II;

3. Elimination of a bigger quantity of foreign bodies of wheat mass and ensuring a nearly constant moisture to wheat neto led to a process of grinding that the specific of electric energy consumption fell from 79.38 kW/t in the version I, from 78.56 kW/t of the version II.

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