

**THE INFLUENCE OF SOME CLIMATIC CONDITIONS FOR QUALITY  
PRODUCTION OF WINTER WHEAT**

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**Abstract**

*The cereales are very important for human consumption and for animal feed too. From this point of view, over the time, it aimed to diversify the assortment varieties, in special for winter wheat. The main objectives for the research project were the analysis of bakery quality potential for winter wheat varieties cultivated in Oltenia Plain according with evolution of climatic conditions.*

Keywords: wheat, quality indicators, milling-bakery industry, climatic conditions

**1. INTRODUCTION**

Cereales used as row material in milling- bakery industry require special attention regarding the productive potential, especially in terms of quality.

This work paper presents the identification of biological material assortment used for seeded of winter wheat surfaces in Oltenia Plain Region, as well as prospection quality of these varieties in direct correlation with the evolution of agrometeorological conditions specific areas and research periods.

Knowing agrometeorological conditions for agricultural years study is required in adequate management, which calls for a specific technology assortment grain studied. in which investigations were conducted.

Climate analysis of a crop year is done during the entire crop vegetation and involves determining the degree of favorability for agriculture on specific date ranges that correspond to processes covering the growth and development of agricultural plants.

Impact assessment of climate variability on grain production enable the preparation of a methodology for monitoring vegetation factors and losses reduction due to adverse weather conditions.

**2. MATERIAL AND METHOD**

The biological material used

The biological material used was the whole range of wheat varieties grown in Oltenia Plain (Dolj County-DJ, Mehedinti County-MH, Olt County-OT).

Quality indicators determined were:

- a) weight (kg/hl);
- b) moisture (%);
- c) protein content (%);
- d) wet gluten (%);
- e) deformation index (mm);
- f) Fusarium (%).

**3. RESULTS AND DISCUSSION**

After three years of study were obtained the following data:

**Table 1. Wheat crop average quality in Oltenia Plain counties (1st of study)**

County	MH (kg/hl)	U (%)	Protein content (% s.u.)	Wet gluten (%)	Deformation index (mm)	Fusarium (%)
DJ	77,84	11,53	14,00	30,48	7,61	0,02
MH	77,80	10,78	14,96	32,55	6,88	0,01
OT	78,01	10,94	13,77	30,32	9,28	0,01
<b>Average</b>	<b>77,88</b>	<b>11,08</b>	<b>14,24</b>	<b>31,12</b>	<b>7,93</b>	<b>0,02</b>

From the table 1, which includes the data regarding the average quality of wheat crop in all counties of Oltenia Plain, result that the highest value of weight was met in Olt County (78,01 kg/hl) and the lowest value in Mehedinti County (77,80 kg/hl), the area average being 77,88 kg/hl.

Wheat crop in 1st year of study had a high content of protein. The average was 14,24% with a maximum level in Mehedinti County (14,96%) and the minimum in Olt County (13,77%).

Wet gluten recorded very good values in all counties of Oltenia Plain (over 30%).

Deformation Index had values under 10 mm in all counties of this area. The highest value was recorded in Olt County (9,28 mm) and the lowest value in Mehedinti County (6,88 mm), with an area average of 7,93 mm.

The *Fusarium* attack manifested less in all counties of Oltenia Plain, with a maximum in Dolj County (0,02%) and minimum in Mehedinti and Olt counties (0,01%).

**Table 2. Average quality of wheat varieties cultivated in Oltenia Plain (2nd year of study)**

Variety	MH (kg/hl)	U (%)	Protein content (% s.u.)	Wet gluten (%)	Deformation index (mm)	Fusarium (%)
Albota*	79,40	10,94	15,03	33,02	7,50	0
Alex	77,99	11,12	13,83	29,07	8,16	0,01
Boema	78,87	11,33	11,96	25,00	6,06	0
Crina	77,43	11,50	13,89	29,52	5,33	0
Dropia	78,21	11,00	14,71	32,34	8,21	0,02
Flamura 85	77,89	11,55	14,55	31,73	9,54	0,01
Fundulea 4	78,32	10,74	14,60	33,85	13,80	0,13
Lovrin 34	76,92	11,46	13,75	29,78	5,65	0,02
Moldova 83*	80,70	11,52	12,07	33,21	4,00	0
Rapid	76,28	11,11	14,87	34,47	7,75	0,00
Romulus	78,50	10,65	15,11	33,88	9,25	0
Selena*	75,50	11,79	11,93	25,91	5,50	0
Serina	76,29	10,85	13,47	30,64	4,20	0,03
Șimnic 30*	77,10	11,53	14,44	32,19	8,37	0
GK Verecke*	78,70	11,21	13,43	28,94	4,50	0

On the average quality of the crop wheat varieties grown in the first year in Oltenia Plain, table 2 shows that the highest weight was determined at Moldova 83 variety (80.70 kg / hl) and the lowest at Selena variety (75.50 kg / hl).

On the other hand, wheat harvest had a protein content with quite large differences between varieties, the highest content variety being met at Romulus variety (15.11%) and the lowest at Selena variety (11.93%).

Regarding wet gluten, from Table 2 we can see all varieties had over 24% wet gluten, maximum value was found at Rapid variety (34.47%).

On the other hand, deformation index was at a good level, the values being between 4 mm at Moldova 83 variety and 13.80 mm at Fundulea 4 variety.

Fusarium attack on wheat grains was very low not more than 0.13% at Fundulea 4 variety and 0.002% at Rapid variety.

**Table 3. Wheat crop average quality in Oltenia Plain counties (2nd year of study)**

County	MH (kg/hl)	U (%)	Protein content (% s.u.)	Wet gluten (%)	Deformation index (mm)	Fusarium (%)
DJ	80,47	12,01	12,27	24,70	4,35	0,11
MH	81,15	11,51	12,25	25,07	7,62	0,11
OT	79,99	11,22	11,96	23,64	6,08	0,20
<b>Average</b>	<b>80,53</b>	<b>11,58</b>	<b>12,16</b>	<b>24,47</b>	<b>6,02</b>	<b>0,14</b>

In the second year of study (Table 3) in the counties of Oltenia Plain the highest weight was found in Mehedinti

County (81.15 kg / hl) and the lowest in Olt County (79.99 kg / hl), the area average being 80.53 kg / hl.

On the other hand, wheat harvest in this year had averaged 12.16% protein content, with limits of 11.96% in Olt County and 12.27% in Dolj County.

Indicator of wet gluten had satisfactory values in Olt County (23.64%) and good in the other two counties (over 24%).

When analyzed deformation index were obtained results below 8 mm for all counties of this area. The maximum value recorded in Mehedinti County (7.62 mm) and minimum in Dolj County (4.35 mm), with an area average of 6.02 mm.

It can also be seen the low percentage of grain attacked by Fusarium in all the counties of the area. The highest value was found in Olt County (0.20%), the lowest in Mehedinti County (0.11%) and average area was 0.14%.

**Table 4. Average quality of wheat varieties cultivated in Oltenia Plain (2nd year of study)**

Variety	MH (kg/hl)	U (%)	Protein content (% s.u.)	Wet gluten (%)	Deformation index (mm)	Fusarium (%)
Alex	80,63	11,67	11,72	23,17	5,05	0,13
Apache*	82,30	11,22	12,32	26,11	3,00	0
Apulum*	82,80	12,07	11,07	21,47	3,50	0
Augustus*	79,90	11,84	12,22	27,18	5,00	0
Boema	80,35	11,68	12,70	24,86	6,90	0,08
Brutus*	80,80	12,19	13,06	26,79	6,00	0,67
Capo	77,17	11,84	13,26	28,53	5,50	0,04
Ciprian*	78,30	12,10	12,75	26,08	5,50	0,13
Crina*	79,80	12,20	14,48	17,20	2,00	0,57
Kiskun Gold*	79,65	12,16	10,82	20,23	2,00	0,24
Kristina*	78,50	12,26	15,18	30,22	3,00	0
Dropia	80,97	11,49	12,35	25,31	5,66	0,10
Flamura 85	80,24	11,40	12,63	26,42	10,14	0,08
Fundulea 4*	79,10	11,35	10,85	18,05	2,62	0,15
Lovrin 34	81,58	11,71	11,85	23,69	8,45	0,32
Moldova 83*	79,50	12,41	14,09	18,94	6,00	0
MVMagdalen*	82,70	11,74	11,62	24,38	5,00	0,35
Mv Miska*	78,00	12,08	13,35	27,02	6,50	0
Pobeda*	82,50	12,31	11,94	23,41	3,50	0
Poiana*	82,50	11,25	13,38	29,42	4,00	0,83
Rapid	79,81	11,35	12,41	25,09	5,25	0,03
Renesansa*	83,00	11,47	10,78	21,33	8,00	0
Romulus	80,83	11,64	11,17	21,46	4,04	0,07
Serina	80,80	11,58	12,18	23,69	4,00	0
Șimnic 30*	79,86	11,64	13,25	30,19	5,33	0,05
MV Toborzo*	80,20	12,09	12,68	26,11	3,50	0,16
MV *Verbunk	81,50	12,12	12,52	26,55	5,00	0,23

GK Verecke*	78,60	12,53	10,62	20,25	2,50	0,07
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\*have been cultivate in one single county

Table 4 contains data on the average quality of the crop wheat varieties grown in Oltenia Plain, in the second year of study. Regarding the weight, values were different depending on the variety, the maximum was found at Renesansa variety (83.00 kg / hl) and the minimum at Capo variety (77.17 kg / hl).

Wheat harvest in 2008 for this area was characterized through protein content with large differences between varieties. Maximum value was found at Kristina variety (15.18%) and the lowest was 10.62% for the GK Verecke variety.

The data from Table 4 shows the existence of some wheat varieties with a wet gluten indicator below 24% - the minimum value was found at Ciprian variety (17.20%). There were also observed varieties that have exceeded 24% of wet gluten – maximum was found at Kristina variety (30.22%).

When analyzing deformation index values were obtained results below 13 mm for all varieties grown there, the less values at Crina and Kiskun Gold varieties (2.00 mm) and the highest value at Flamura 85 variety (10.14 mm).

Fusarium attack on wheat grains (Table 4) was uncommon at the varieties which manifested attack, with maximum value of 0.83% at Poiana variety and minimum of 0.03% at Rapid variety.

**Table 5. Wheat crop average quality in Oltenia Plain counties (3 rd year of study)**

County	MH (kg/hl)	U (%)	Protein Content (% s.u.)	Wet gluten (%)	Deformation index (mm)	Fusarium (%)
DJ	75,73	12,52	12,27	21,82	5,62	0,25
MH	76,92	12,24	12,01	21,20	5,06	0,06
OT	76,83	12,13	12,37	22,97	8,04	0,01
<b>Average</b>	<b>76,49</b>	<b>12,30</b>	<b>12,21</b>	<b>22,00</b>	<b>6,24</b>	<b>0,11</b>

Data on the average quality of the crop wheat counties of Oltenia Plain in 3rd year of study, presented in Table 5 shows that, in terms of weight, the highest value was found in Mehedinti County (76.92 kg/hl) and the lowest in Dolj (75.73 kg/hl) area average being 76.49 kg/hl.

The protein content of the wheat crop in the counties of Oltenia Plain was in averaged 12.21%, with variations between 12.01% in Mehedinti County and 12.37% in Olt County.

Wet gluten content (Table 7.14) recorded satisfactory values in all counties (22 and 24%).

Deformation index was below 9 mm for all counties of Oltenia Plain. The highest value was found in Olt County (8.04 mm), the lowest in Mehedinti County (5.06 mm), with a zonal average of 6.24 mm.

The Fusarium attack on the wheat grains were obtained values below 0.3% in all counties of Oltenia Plain. Maximum value was 0.25% in Dolj County,

minimum of 0.01% in Olt County and the average area was 0.11%.

**Table 6. Average quality of wheat varieties cultivated in Oltenia Plain ( 3 rd year of study)**

Variety	MH (kg/hl)	U (%)	Protein content (% s.u.)	Wet gluten (%)	Deformation index (mm)	Fusarium (%)
Alex	76,19	12,52	12,05	22,47	7,27	0,08
Andino*	77,50	11,69	12,12	20,27	3,50	0,07
Boema	77,19	12,50	11,75	18,87	4,48	0,09
Briana*	75,80	12,23	13,28	27,16	4,25	0,15
Centro*	74,20	12,95	11,10	17,28	1,00	0
Ciprian*	74,00	12,04	11,18	21,19	4,00	0,68
Crina	76,76	12,30	11,59	19,97	8,68	0,37
Dropia	76,69	12,30	12,35	23,88	6,86	0,13
Flamura 85	76,32	12,25	12,27	21,23	6,07	0,07
Lovrin 34	76,87	12,27	12,14	23,22	6,00	0,05
Liubinskaya*	76,30	10,93	13,91	30,83	2,50	0
Partizanka*	74,40	11,35	10,77	19,36	8,00	0,07
Renan*	80,00	11,19	12,43	22,20	1,00	0
Romulus*	77,15	12,01	11,43	27,85	5,00	0
Serina*	77,50	12,40	12,46	24,68	4,21	0,15
Solario*	77,20	12,28	10,96	14,53	13,50	0
Trivale*	72,70	11,67	14,26	32,01	13,00	0,07

\*it was grown in one county

From the above table we can observed that in the 3rd year of study the varieties grown in Oltenia Plain had different weight values depending on the variety. Thus, the best value was found at Renan variety (80.00 kg/hl) and the low value at Trivale variety (72.70 kg/hl).

The wheat harvest was characterized by a maximum of 14.26% protein content at Trivale variety and minimum of 10.77% at Partizanka variety.

It is also clear that most of the varieties registered a wet gluten content below 24%. But there are varieties that have exceeded that threshold (Briana, Liubinskaya, Romulus, Serina and Trivale).

Analyzing deformation index led to values under 15% for all cultivated varieties. Maximum was found at Solario variety (13.50 mm), while the minimum at Renan and Centro varieties (1.00 mm).

For Fusarium attack on wheat grains (Table 6) can be observed small values for varieties where the attack showed, with highest value of 0.68% at Ciprian variety and the lowest of 0.07% at Andino, Flamura 85, Partizanka and Trivale varieties.

From the following figures it can be seen evolution on counties and years of study indicators and the climatic conditions:

Fig 1

**WEIGHT**

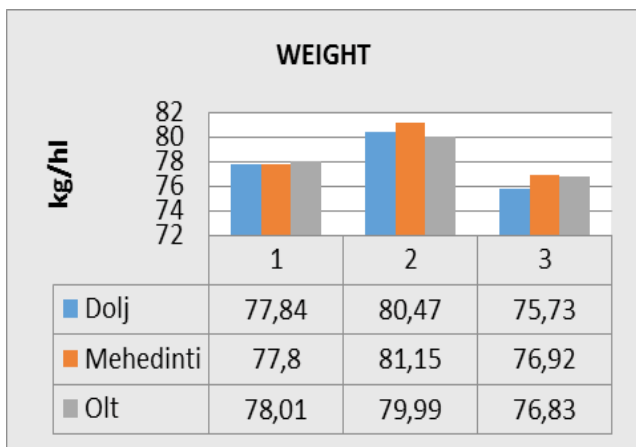


Fig 2

**MOISTURE**

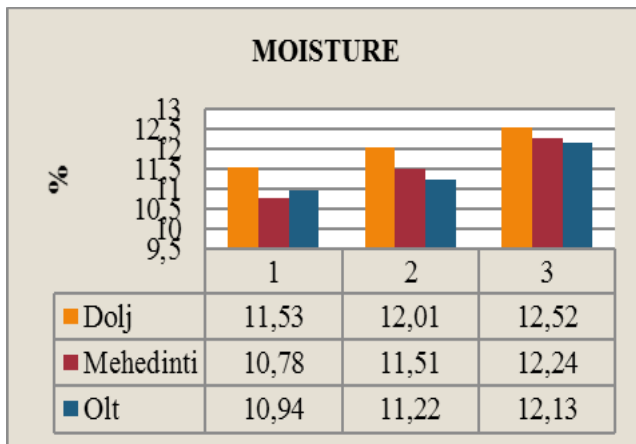


Fig 3

**PROTEIN CONTENT**



Fig 4

**WET GLUTEN**

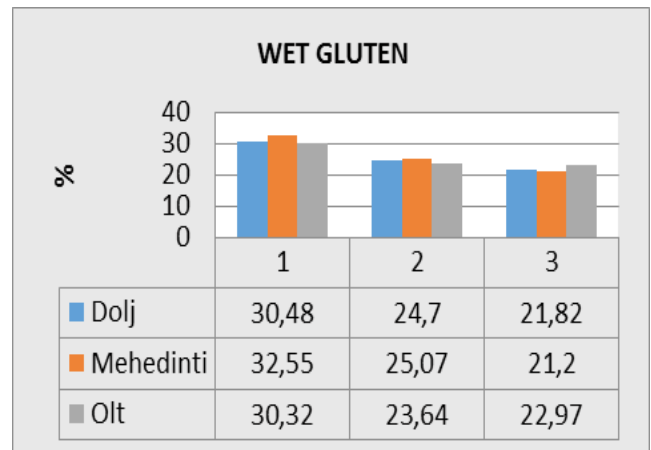


Fig 5

**DEFORMATION INDEX**

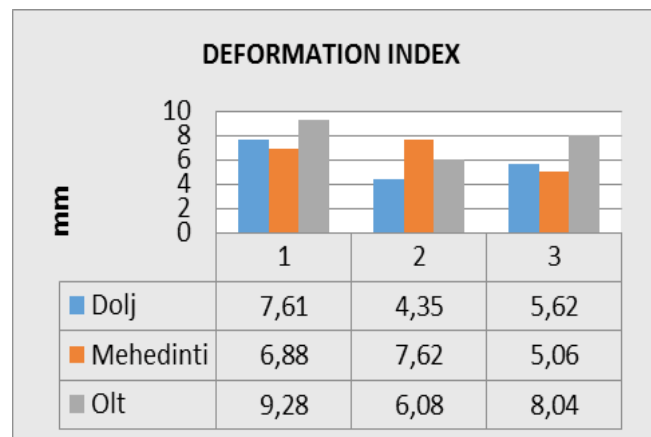
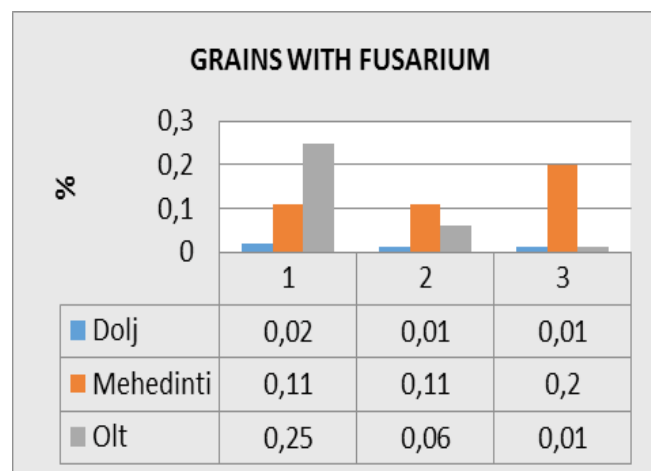


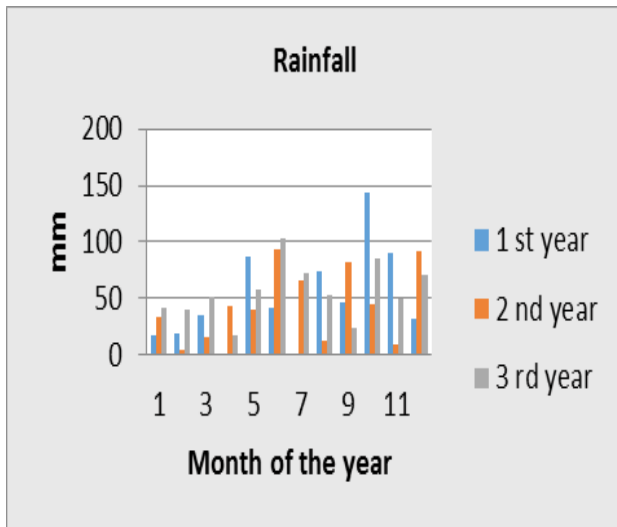
Fig 6

**GRAINS WITH FUSARIUM**



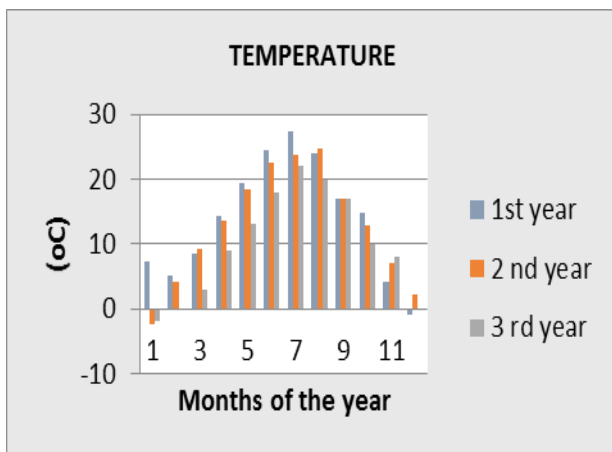
**RAINFALL (mm)**

**Fig 7**



**TEMPERATURE (°C)**

**Fig 8**



#### 4. CONCLUSIONS

The research conducted in Oltenia Plain on the quality of wheat harvest, allowed the following conclusions:

1. were planted 42 varieties of wheat, of which 24 romanian varieties.
2. The range of varieties cultivated relatively constant included Romanian varieties: Alex, Boema, Dropia Flamura 85, Fundulea 4, Lovrin 34, Moldova 83, Serina, Şimnic 30, Briana, Ciprian, along foreign varieties Apache, Brutus, Kiskun Gold, Kristina, MV Toborzo, MV Verbunkos, Pobeda, Renesana.
3. As average on Oltenia Plain area, it can be noted that the wheat yields were framed in standard limits for bakery, the average weight being 77.43 kg / hl.

4. The average protein content of these three years of study was over 12% in all counties of Oltenia Plain.

5. Among the varieties, Albota, Flamura 85, Moldova 83, Rapid and Şimnic 30 were detached with averages over 13% protein, while the remaining varieties were contents between 12 and 13%. On the other hand, the varieties Flamura 85, Moldova 83 and Rapid are distinguished by over 12% protein, even in unfavorable years.

6. Dolj and Mehedinti counties are characterized by a gluten content of 25-26%, compared to under 24% in Olt county.

7. The average of wet gluten content of wheat crops obtained in Oltenia Plain was 24.5%, which means a good appreciation for bakery quality.

8. From all varieties cultivated in Oltenia Plain, Albota, Rapid, Romulus and Şimnic 30 were detached with an average wet gluten content over 26%. Were identified varieties with values under 24% wet gluten (Boema and Fundulea 4) and values between 25-26% for remaining varieties.

9. Deformation index had values between 4 and 6 mm, which, from this point of view, fall wheat harvest of Oltenia Plain as having a good quality for bakery industry.

10. For all cultivars resulting values of deformation index below 14 mm, especially in the first year of study.

11. Fusarium attack on wheat grains was not a problem in this area, the average value being 0.09%; also, in all counties of Oltenia Plain, the attack was under 0.20%. However, the average values on varieties were below 0.3%, without affecting, from this point of view, bakery quality.

12. Changing climate conditions influence the quality indicators as follows:

- a) weight had low values at high temperatures and low rainfall;
- b) moisture was higher when there were high amounts of rainfall and the temperatures were lower than normal specific period of the year;
- c) protein content was higher in periods of intense drought;
- d) wet gluten values of wheat grains were proportional to the protein content;
- f) Fusarium grains were found in greater proportion when temperatures and rainfall were raised.

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