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THE PRODUCTIVITY OF SOME WHEAT VARIETIES IN THE SOIL AND CLIME CONDITIONS FROM SOUTH-WESTERN ZONE OF MEHEDINTI COUNTY

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ABSTRACT

The researches aimed the comparative study of some winter wheat varieties in conventional cropping system in the conditions of reddish preluvosoil from Vanju Mare, on a 400 ha surface for a better knowing of their features in order to recommend them for cropping. During two years (2016 – 2017) there have been cropped the following wheat crop kinds: Glossa – romanian variety and two austrian varieties: Balaton and Astardo.Regarding the yield obtained by Glossa variety, it recorded an average of 6.100 kg/ha and Balaton and Astardo varieties, an average yield of 7200 kg/ha. The high yield recorded by austrian varieties is due to the fact that they belong to Premium group, very productive, very tolerant to drought and with high ecological plasticity, with good winter resistance, high tillering capacity, highly receptive to fertilizers and superior as quality. The biologic potential is very high, reaching 11.000 kg/ha.

The protein content of the wheat grain depends on the following factors: the variety, the cropping technology (irrigation, fertilization) and the soil and clime conditions. Good protein content determines a good baking quality. Among the technological factors, the fertilization is the most important that increases the protein content of the wheat kernels. The wet gluten content and the falling index are favorably influenced by the nitrogen fertilizer applying. There is recommended the cropping of wheat varieties that have a high production capacity, with a good resistance to the main risk factors of the clime, with tolerance to the main foliar diseases, with superior quality indicators from different maturity classes.

INTRODUCTION

As a result of genetic diversity as well as phenotypical and genetic plasticity the wheat crop is cultivated all over the globe. For each specific set of environment conditions fits another ideal genotype, taking account of the complexity of interactions within plant – soil – clime system (Popescu Cr., 2009). Although, ideal for an area, a crop kind cannot fit in another zone, no matter the surface of it because of variability of soil and clime conditions (Popescu Cr., 2016). An example in this manner is the fact that some crop kind with high productivity potential, found in France on large surfaces, as: Texel, Thesee or Orqual do not fit in the ecological area of Oltenia and Romania, as a whole. Their tardiness in very stress conditions from us determine the diminishing of the production potential. The high surviving capacity over winter is a requirement for establishing the production with winter wheat. The number of leaves, high tillering and broad distribution of leaves are, also, challenging features. A valuable crop kind must have a high phenotypical stability, no matter the environmental factors that influence them. The phenomenon of fight against drought plays an important role in the adaptation to the specific environmental conditions. The precocity is another feature of high importance of wheat crop kinds due to the fact that it allows a better timing between critical phases of plant developing and the periods with more favorable clime conditions which reduce the risk of losses determined by drought and scorching heat. (Paunescu Gabriela, 1999).

MATERIALS AND METHODS

During two years (2016-2017) there have been cropped the following wheat crop kinds: Glossa – Romanian crop kind and two austrian ones: Balaton and Astardo in the conditions of reddish preluvosoil from Vanju Mare, on surface of 400 ha for a better knowing of their potential in order to be recommended to the loco farmers and spreading for cropping in this area. There were made both filed and laboratory determinations by S.C, Tudor Mihai Serv due to it specific of manufacturing baking products.

In field there were made the following determinations:

- the number of emerged plants per square meter – the average of two countings, one after drilling and the second one, at harvest;
- the number of ears per square meter – the average of two determinations at harvest;
- the plants height – the average of a bunch of plants from the soil surface up to the top of the arista of the ear;
- the yield – there was weighted the yield per hectare at 14% moisture.

In laboratory there was determined the quality of the yield by:

- grain moisture (%) by spectrometric method, using NIR analyzer;
- protein content (%) by spectrometric method, using NIR analyzer INFRAMATIC 9200;
- Zeleny sedimentation parameter (ml) - by spectrometric method, using NIR analyzer INFRAMATIC 9200;
- wet gluten content (%) - by spectrometric method, using NIR analyzer INFRAMATIC 9200;
- falling parameter (seconds) – the system for determination of alpha amylase activity PERTEN model FALLING NUMBER 1310;
- the mass of a thousand grains (MTG) (g) – weighting 1.000 grains at electronic scale of KERN type;
- the hectoliter mass (HM) (kg/hl) – by specific apparatus.

For these analyses there was used an average sample of about 2 kg.

RESEARCH RESULTS

RESULTS ON MORPHOLOGICAL CHARACTERS OF RESEARCHED WHEAT CROP KINDS

The number of emerged plants/m^2 has had the average value between 320 plants with Glossa crop kind and 340 plants with Astardo (table 1, graph 1).

The number of ears/m^2 has oscillated between 412 with Glossa and 492 with Astardo. The Astardo crop kind recorded the highest number because, by decreasing the number of seeds at sowing, at 380 germinable grains/m^2, using a quantity of seeds of 170 kg/ha and by increasing the distance between rows at 25 cm the resistance to fall increases and the tillering phenomenon is higher and the tillers are stronger. Also, by a high capacity to fructification, the productive potential is very high.

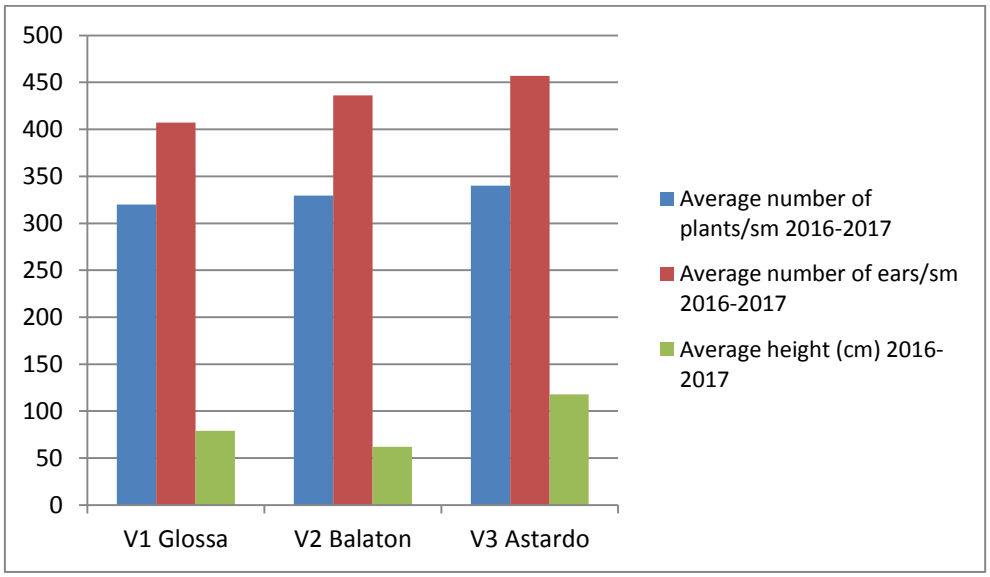
As regard the plants height, the average value is between 79 and 118 cm. in low rainfall conditions (2016) the water stress began at stem elongation till ear growing. The lowest shortest plants were with Balaton crop kind due to genetic feature of short to average height of this crop kind and the tallest was recorded by Astardo crop kind, of 118 cm, being a very tall crop kind.

In the cropping technology, with this crop kind there was applied a growth regulator – Optimus 175 EC (2-3 l/ha) at the beginning of stem elongation and the first and second internode.

Table 1.

Morphological characters with researched wheat crop kinds

Variant	Crop kinds	Number of plants/m^2		Average	Number of ears/m^2		Average	Height (cm)		Average
Years		2016	2017		2016	2017		2016	2017	
V_1	Glosa	316	324	320,0	402	412	407	76	82	79
V_2	Balaton	325	334	329,5	410	462	436	60	64	62
V_3	Astardo	330	354	340,0	422	492	457	116	120	118



Graph 1. Morphological characters with researched wheat crop kinds

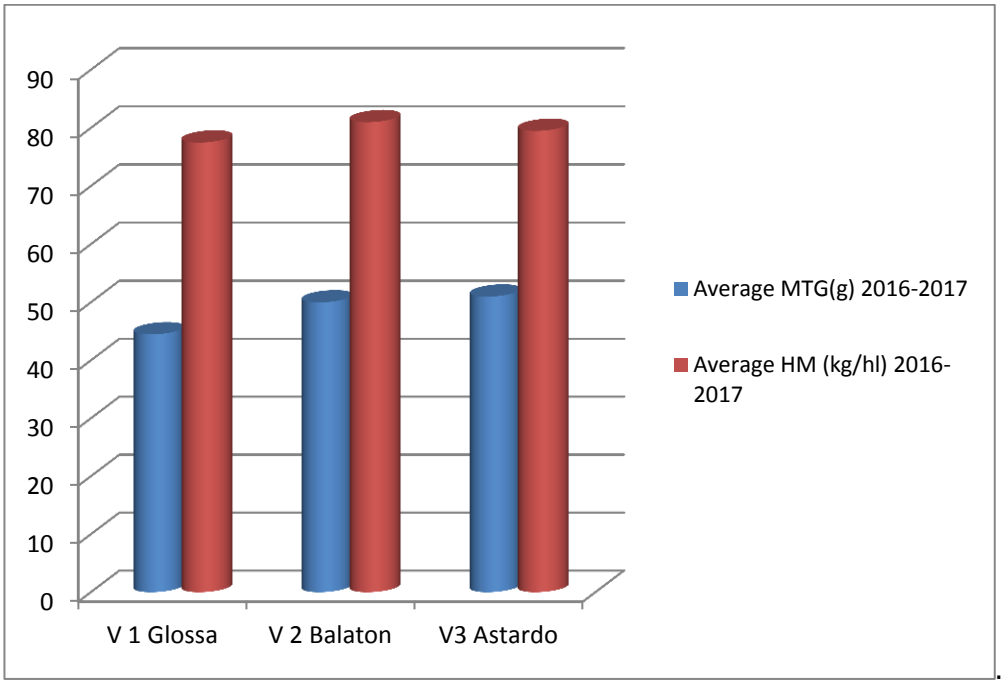
RESULTS ON THE MTG AND HM WITH RESEARCHED WHEAT CROP KINDS

As regard the mass of a 1.000 grains, the Astardo crop kind has recorded the highest value, of 51 g and the lowest, by Glossa crop kind, of 44.5 g. different clime conditions recorded in the two years of experimentation but the previous plant, too (sunflower, oilseed rape and pea) have influenced this feature.The hectoliter mass has had values between 77.5 kg/hl with Glossa and 81 kg/hl with Balaton. All three crop kinds had adequate values of these physiological indicators (table 2,graph 2).

Table 2.

The mass of a 1.000 grains (MTG) and the hectoliter mass (HM) with the researched wheat crop kinds

Variant	Crop kinds	MTG (g)		Average	HM (kg/hl)		Average
Years		2016	2017		2016	2017	
V_1	Glossa	43	46	44.5	77	78	77.5
V_2	Balaton	48	52	50.0	80	82	81.0
V_3	Astardo	49	53	51.0	79	80	79.5



Graph 2. The mass of a 1.000 grains (MTG) and the hectoliter mass (HM) with the researched wheat crop kinds

RESULTS ON THE NUMBER OF GRAINS/EAR AND THE MASS OF THE GRAINS/EAR WITH RESEARCHED WHEAT CROP KINDS

As regard the number of grains/ear the average values ranged from 39 to Glossa and 46 to Astardo. The weight of the grains in an ear, the third studied element, Glossa crop kind has recorded the lowest value, of 1.37 g/ear and Astardo has recorded the highest value, of 2.12 g/ear which means that increased rates of nitrogen influence this feature, no matter the crop kind (table 3).

Table 3.

The number of grains/ear and the weight of grains/ear with the researched wheat crop kinds

Variant	Crop kinds	Number of grains/ear		Average	Weight of grains/ear (g)		Average
Years		2016	2017		2016	2017	
V_1	Glossa	38	40	39	1.86	1.88	1.37
V_2	Balaton	40	42	41	1.88	1.92	1.00
V_3	Astardo	44	48	46	2.11	2.14	2.12

RESULTS ON THE YIELD AND THE QUALITY FEATURES OF IT WITH RESEARCHED WHEAT CROP KINDS

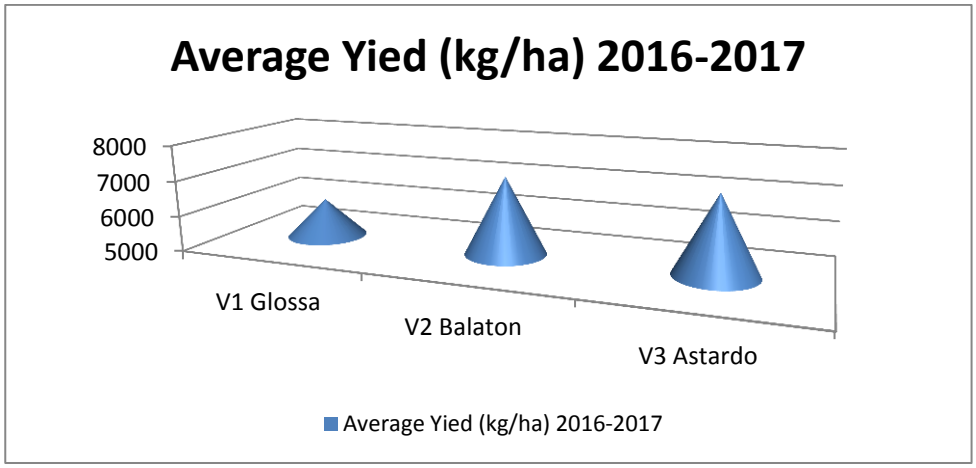
Regarding the yield, Glossa crop kind has recorded an average value of 6.100 kg/ha and Balaton and Astardo, of 7.200 kg/ha. Higher yield of the two Austrian crop kinds is explained by the fact that they belong to Premium group, very productive, very tolerant to drought, with good resistance to falling, wintering and diseases as well as high tillering capacity and receptive to high rates of fertilizes (autumn fertilization by complex fertilizers of 18-46-0 type in 150 kg/ha and in the spring, by urea, 200 kg/ha, at 1-3 March and 150 kg/ha ammonium nitrate at 19-20 April. Also, they are superior as qualitative indicators. The biological potential of these crop kinds is high, reaching 11.000 kg/ha.

As regard the protein content, wheat of good quality has over 13%, satisfactory values being 10-12% and unsatisfactory values under 10%. The flour with low protein content is suitable for snacks and cookies. The flour with high protein content is suitable for bread. Bakers use the results about protein content in order to evaluate the water absorption and the time of dough developing during baking process because high protein content needs more water and a longer time for the dough to get optimal consistency (table 4, graph 3,4).

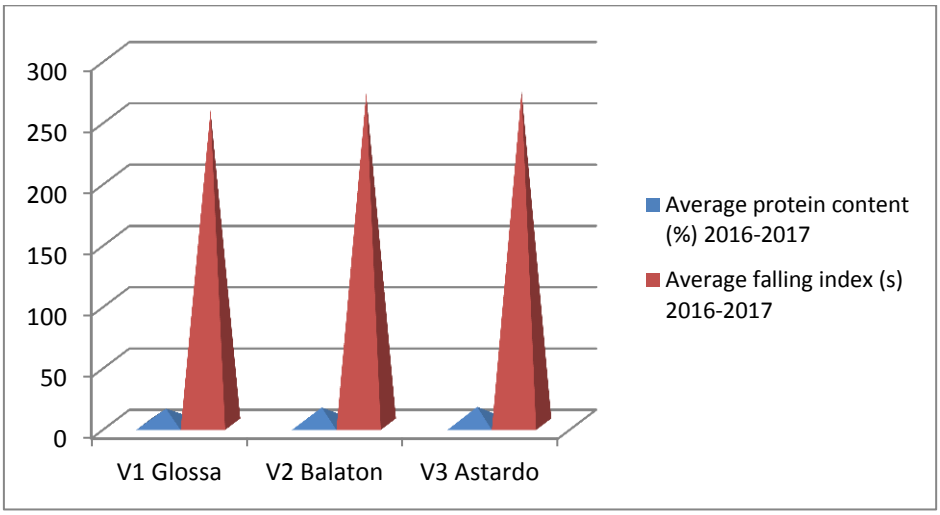
Table 4

The yield, the protein content and the falling index with researched wheat crop kinds

Variant	Crop kinds	Yield (kg/ha)		Average	Protein content (%)		Average	Falling index (s)		Average
Years		2016	2017		2016	2017		2016	2017	
V_1	Glossa	5900	6300	6100	12.5	13.0	12.7	250	262	256
V_2	Balaton	6800	7600	7200	13.5	14.0	13.7	260	280	270
V_3	Astardo	7000	7400	7200	14.0	14.5	14.2	268	276	272



Graph 3. The yield, with the researched wheat crop kinds



Graph 4. The protein content and the falling index with researched wheat crop kinds

The most rapid method of appreciation of wheat quality is the sedimentation test. After research there was we have confirmed that the sedimentation test is in close relation with the volume of the bread, the pharinographic mark, the gluten index and the raw protein content and less correlated between these indicators and the Pelsenke index and

the extensographic mark. Both Zeleny index and gluten index correctly express the quality of wheat baking. These indicators, along with the pharinographic mark and the volume of the bread are the basis elements in appreciation of the wheat for baking. Good flour for baking must have a sedimentation test value of 60 ml. As the value of the sediment increase as does the gluten content and the flour is better (table 5). The values can be of 20 or less for the wheat with low protein content and of 70 or more for wheat with high protein content and strong gluten.

Table 5.

The sedimentation index, the wet gluten and the dough resistance with the researched wheat crop kinds

Vari-ant	Crop kinds	Zeleny sedimentati-on index (ml)		Avera-ge	Wet gluten (%)		Avera-ge	Dough resistance (mm)		Avera-ge
Years		2016	2017		2016	2017		2016	2017	
V_1	Glosa	84	86	85.0	24	26	25,0	108	109	108.5
V_2	Balaton	90	91	90.5	26	28	27,0	114	115	114.5
V_3	Astardo	89	90	89.5	35	36	35,5	116	117	116.5

The wet gluten content was initially considered as the most eloquent qualitative parameter of the flour (STAS 90-88). Generally, high gluten content is an indicator that certain flour has good baking features. Gluten of good quality has to be agglomerated resistant enough and elastic. In order for flour to be baked the wet gluten has to be higher than 26%. With the case when this value is not reached, the wheat flour has to be ameliorated by vital gluten. The gluten is responsible by elasticity and extensibility of the flour. The wet gluten content reflects the protein content and it is a specific requirement of flour that is requisite by bakers. Appreciated flour has a wet gluten content of 22-24% and a not satisfactory one has a wet gluten content of under 22%.

CONCLUSIONS

1. An important criterion for choosing resistant plants to drought is the size and the weight of the grain.
2. Drought influences highly influences the height in comparison with the MTG.
3. The components that are responsible for yield reduction are the number of ears and the rate of tiller survival, in drought condition.
4. The precocity differences with wheat are mainly determined by the varied requirements for overwinter and the light duration.
5. The precocity and the duration of grain growing are features that determine the weight of the grain, the MTG being higher with the plants with early anthesis.
6. The yield, the number of grains in ear, the biomass and the height of plants were more thermo sensible than the number of ears per square meter and the MTG.
7. The optimal combination of overwintering and light period conditions that give best results differs from one year to another in function of rainfall and heat.
8. The protein content of wheat grain depends on the: crop kind, cropping technology (irrigation, fertilization) and soil-clime conditions.
9. High protein content is associated with a good baking quality. Among the technological factors, fertilization is the most important.
10. The wet gluten and the falling index are favorably influenced by the nitrogen fertilizers.

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