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INFLUENCE OF VARIETIES AND SOME QUALITATIVE INDICATORS UPON ON YIELD OF SEVERAL WHEAT VARIETIES IN SOUTH EASTERN PART OF ROMANIAN PLAIN

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Abstract

All grown plants have high nutritional value but wheat is the most important. The quality of gluten (viscosity, elasticity, extensibility, resistance to proteolytic fermentation in the fermentation process, etc.) is very important, it gives wheat quality. The protein content of the grains is a most important qualitative factor that gives the harvesting use value. The gluten content is dependent on the protein content of the grains. It is an indicator on the basis of which the quality class of the harvest obtained is determined. The researches studied the crop behaviour of six Premium wheat varieties in the soil and climate conditions in Calaraşi area during 2017. We analized some qualitative indicators (the content in protein and gluten, the hectolitre weight and a mass of 1000 grains). The best results were recorded in Tamino variety, where the efficiency reached 8,985.0 kg / ha.

Key words**:** *wheat, qualitative indicators, yield, technology, varieties*

INTRODUCTION

Wheat is a grown plant with a high nutritional value [6]. This plant can be sown on extended areas. The attention that the plant enjoys is due to the high content of the grains in carbohydrates and proteins and the rate of these substances corresponding to the requirements of the human body. Another advantages of this plant are long preservation of the grains and the fact that they can be transported without difficulty [7].
Wheat offers the advantage of being fully mechanized, from agronomical point of view [8]. Wheat is a very good precursor for most crops, because it leaves the field early and allows the ploughing done even from summer [10].
The wheat quality is due to the quality of gluten (viscosity, elasticity, extensibility, resistance to proteolytic fermentation in the fermentation process, etc.) [9]. The protein content of the grains is the most important qualitative factor that gives the harvesting use value after production, which is the quantitative indicator [1].
The moist gluten content is an indicator of the particularly important quality, which determines the quality class of the harvest and is dependent on the protein content of the grains [2] and the quality of the bakery wheat. The values of this indicator can vary between 0 and 100% [13].
The basic criterion for the choice of varieties regardless of the grown cereal variety remains the potential for production. We should not neglected, also, the quality that gives the market value of the harvest [4].
The quality of the genetic material of the studied varieties was highlighted by the high quality indices and very high efficiency, so Premium wheat varieties come to farmers who were unwilling to sacrifice the production for quality [3]. Knowing the quality of wheat harvest is very important for the millers (they are interested in benefits following the sale of the fine) and for the bakers, who are interested in bakery indicators [12].

In order to increase the production at the surface unit, it is needed to use more and more efficient biological material (varieties and hybrids) [5]. The crop can be increase by using modern technologies, application of scientific research results and the use of innovations in the agricultural production [11].

MATERIALS AND METHODS

The researches follow the study of the crop behaviour (efficiency) of six wheat varieties in the soil and climate conditions of Călăraşi area during 2017. We analized some qualitative indicators (the content in protein and gluten, the hectolitre weight and a mass of 1,000 grains). We used three variants, each variant having three repetitions, the surface of the experimental plots being 150 square meters. In table 1 are presents the varieties with early precociousness. We choose Arnold variety as control for comparing the results.
The experiments took place in the natural environment provided by the experimental field of SC Probstdorfer Saatzucht Romania SRL, in Modelu locality, Calarasi County, and the quality indicators determinations in the company own laboratory.

Table 1. Experimental variants

Variant	Variety
V1	ARNOLD-**Mt**
V2	BITOP
V3	FULVIO
V4	LAURENZIO
V5	MIDAS
V6	TAMINO

The experience was placed on chernozem, a soil category with excelent properties, rich in high quality humus (mull calcic).
Water supply of crops is the main problem of agriculture in the county, due to the rain regime, which varies greatly during the vegetation period.
This rain regime is more favourable to the physiological requirements of autumn wheat than maize that is affected by the drought between July and August period.
The climate in the Baragan Plain is of temperate oceanic and temperate continental type, with rarer tropical continental and tropical sea air, but also Arctic air.
Summers are cold, with little precipitation and winters are relatively cold, sometimes marked by strong snowstorms, but also by frequent heating periods. The average annual temperature is 11.35°C, and the maximum recorded so far is 41.1 ° C in Calarasi. The absolute minimum was recorded at Calarasi (-30.0 ° C) on 9th January 1938.

Table 2. Precipitations recorded in Modelu locality, during the period 2012-2017

Month	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	
year	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**P mm**
2012	78	-	8	30	154	20	6	66	47	34	13	51	**507**
2013	50	43	18	41,5	50	121	18	46	112	44	8	-	**551.5**
2014	11	-	51	29	112	93	48	12	37	64	43	113	**613**
2015	27	57	88	44	6	52	39	56	29	73	101	-	**572**
2016	13	21	49	53	74	48	23	33	52	20	74	-	**460**
2017	-	17	65	57	49	50	132	20	-	-	154	37	**581**
Average 2012-2017	**29.8**	**23**	**46.5**	**42.4**	**74.2**	**64**	**44.3**	**38.8**	**46.2**	**39.2**	**65.5**	**3.5**	**574.4**

Source: Modelu Weather Station.

The relief is uniform, specific to the plain area, and the predominant winds in Calarasi county are those from the North and North-East (Crivat and Austrul), as well as from the West and South-West (Baltaretul).
The observations on precipitation variation were made in Modelu, Calarasi County, in the period 2012-2017, with its own rain meter.
In terms of precipitation volume (table 2), we can see that the highest values (613mm) were recorded in 2014, 2016 having the lowest values (460mm). The average of 574.4mm

precipitation was exceeded in the year 2014 (613mm) and year 2017 (581mm). Regarding the monthly precipitation volume in 2012-2017, we can see that May, June and November were the rainiest periods.

The technology used was in the scarification work followed by a disk work concomitantly with DAP type fertilizer work. Sowing was performed on 10th October. Chemical fertilizers was applied at a rate of 200 kg in March with NH4NO3 and 200 kg DAP in April. For phytosanitary treatments we used Biscaya insecticide, Menara fungicide and Mustang herbicide.

Premium wheat varieties chosen for research are: Arnold, Bitop, Fulvio, Laurenzio, Midas and Tamino.

ARNOLD wheat variety. It is a very early, with a high trunk and a very good resistance to diseases. It offers good productions with a high quality and can be grown on highly climate-differentiated surfaces. ARNOLD have a moist gluten content of over 35%. It is recommended a growth regulator at the end of the twinning or at the beginning of the straw stretch - between the first and second internodes (2 L/ha).

BITOP wheat variety. Premium wheat, very early in the bakery Group 8, offers excellent productions and high protein content. BITOP is very resistant to dropping, very early and extremely resistant to virosis and yellow rust. It is well suited to surfaces that are climate differentiated, It has, also, very high capacity to produce quality protein.

FULVIO wheat variety is part of bakery group 7. It is an early variety, which ensures constant productions, a high hectolitre mass and a high harvest quality. It has a good resistance to brown rust, to mildew and has a good tolerance to yellow rust. Medium - high trunk (100 cm).

LAURENZIO variety is a new variety of Premium wheat with very good protein quality use in the bakery industry. It has a very good wintering resistance. The plant height is 105 cm, it has a very good mildew resistance, good rust resistance and a medium yellow rust resistance. Protein content: 15-18%.

MIDAS wheat variety. Wheat variety of Premium genetics. It is very resistant to winter, with good twinning. and superior The production potential is superior and it has a medium height (100-105 cm). It is very productive, has a good quality. It is resistant to winter, resistant to dropping and drought and to mildew. This variety has constant bakery characteristics, regardless of climatic, potentially biological conditions: 10,000 - 13,000 kg/ha.

TAMINO wheat variety. It is a variety of autumn wheat, semi-early, with very good productive potential and very resistant to frost. The plants grows medium-sized, has a medium twinning capability. This variety has a very good tolerance to yellow rust and fusariosis. The grains have high hectolitre mass and a protein content of 15%, being part of Premium Grains Group.

In the laboratory the following determinations and analyzes were carried out: the mass of 1,000 grains; hectolitre mass; protein content and gluten content.

The mass of 1,000 grains (MMB) was established after harvesting for each variety. It was expressed in grams. It was determined as follows: a representative sample was taken from the seed mass, seeds were numbered randomly and grouped by 10, after which by 100 and then by 500 were grouped. The two samples of 500 were weighed separately and the results gathered. A mass of 1,000 seeds was thus obtained.

For determine the quality indicators (protein content, gluten and hectolitre weight), we used the Foss Infratec laboratory with a high precision instrument.

The working mode was carried out as follows: each of the samples was tested by means of a manual probe, the resulting sample was divided by means of the divider, and then sifted using a rectangular sieve of 2.2 mm. From the resulting sample, approximately 1kg was introduced into the Foss Infratec laboratory. After performing the analyzes, the results were displayed on the equipment display and on the analytical report printed attached to the equipment.

The calculation of production per ha was achieved by the rate of the weight of the grains harvested at the surface of the experimental plot to the area of one ha. The most important quality factor after production is the grain protein content which makes harvesting very valuable in terms of use.

RESULTS AND DISCUSSIONS

The protein content varies between 13.2% and 14.9%. The lowest content was recorded in the Midas variety, with a difference of -0.8% compared to the control and -1.2% against the average of variants, 14.4% (table 3). Fulvio and Tamino varieties obtained the highest value 14.9% recording an increase of 0.5% compare with the average. All varieties recorded values of protein content of over 14.0 % , except Midas variety.

Table 3. Influence of varieties and technology upon the protein content

Variety	Protein content %	Dif. to Mt %	Dif. to average %
Arnold - **Mt**	14	-	-0.4
Bitop	14.7	+0.7	+0.3
Fulvio	14.9	+0.9	+0.5
Laurenzio	14.5	+0.5	+0.1
Midas	13.2	-0.8	-1.2
Tamino	14.9	+0.9	+0.5
Average	**14.4**	-	-

Source: own calculation

Table 4. Influence of varieties and technology upon the gluten content

Variety	Gluten content %	Dif. to Mt %	Dif. to average %
Arnold - **Mt**	30.1	-	-1.5
Bitop	31.9	+1.9	+0.3
Fulvio	33.4	+3.4	+1.8
Laurenzio	32.8	+2.8	+1.2
Midas	29.1	-1.0	-2.5
Tamino	32.5	+2.5	+0.9
Average	**31.6**	-	-

Source: Own calculation.

Regarding the gluten content, compared to Arnold, where the value of 30.1% was recorded, Fulvio variety was marked by a plus of 3.4% (32.5%). Midas variety had 29.1%, with a minus of 1.0% below the control value and -2.5% below the average gluten content (Table 4). The average gluten content (31.6%) was exceeded by Bitop (31.9%), Fulvio (33.4%) and Tamino varieties (32.5%).

The value of the hectolitre weight and MMB of the varieties in experience are show in table 5 and table 6. Laurenzio variety has highest hectolitre weight, 81.6%, with a 3.5% increase over the control and 3.1% over the average of the studied varieties. Variant 2- Bitop, (75.6%) and variant 6- Tamino (75.7%) obtained the lowest values. The rest of varieties recorded values above 78.0 %, their average value being 78.9%.

Table 5. Influence of varieties and technology upon hectolitre weight

Variety	Hectolitre weight %	Dif. to Mt %	Dif. to average %
Arnold - **Mt**	78.1	-	-0.4
Bitop	75.6	-2.5	-2.9
Fulvio	79.4	+1.3	+0.9
Laurenzio	81.6	+3.5	+3.1
Midas	80.8	+2.7	+2.3
Tamino	75.7	-2.4	-2.8
Average	**78.5**	-	-

Source: Own calculation.

The values of mass of 1000 grains varied from 37.27 g, in the Fulvio variety and 49.52 g in the Tamino variety, with an average value of 45.79 g (Table 6).

Table 6. Influence of varieties and technology upon MMB

Variety	MMB G	Dif. to Mt g	Dif. to Average g
Arnold - **Mt**	47.4	-	+1.61
Bitop	47.82	+0.42	+2.03
Fulvio	37.27	-10.13	-8.52
Laurenzio	47.67	+0.27	+1.88
Midas	45.08	-2.32	-0.71
Tamino	49.52	+2.12	+3.73
Average	**45.79**	-	-

Source: Own calculation.

The production obtained under the soil and climate conditions of the year 2017, recorded values varying from 7,809.0 kg/ha to Fulvio variety and 8,985.0 kg/ha for Tamino variety(table 7). All the varieties analyzed recorded an

yield exceeded 7,000.0 kg/ha, the average value being 8,252.0 kg/ha. The best crop was obtained by Tamino variety, 14.2% against the control, with a crop efficiency of 1,117.0 kg/ ha, a very significant increase. Tamino variety also produced a very significant production difference (733.0 kg/ha) compared to the average (8,252.0 kg/ha). Tamino variety is follow by Midas variety, with a harvest of 8,572.0 kg/ha, wich means an increase of 8.9% compared to the witness and a plus crop of 704.0 kg / ha, very significant. The increase achieved by Midas variety was highly significant with a value of 320.0 kg/ha, compared to average (Table 7).

The varieties that recorded productions below the control value are Bitop (7,838.0 kg/ha), with a minus of 0.4% and Fulvio variety (7,809.0 kg/ha) with a minus 0.7%.

The Fulvio variety obtained a harvest minus, materialized in the production difference of 443.0 kg/ha, comparative with the average production, which in relative values materializes in a production minus of 5.4% (Figure 1).

Table 7. Influence of varieties and technology upon the yield

Variety	Production kg/ha	Difference to Mt %	Difference to Mt kg	Signific.	Diff. to average %	Diff. to average kg	Signific.
Arnold - **Mt**	7,868.0	Mt	Mt		-4.7	-384.0	00
Bitop	7,838.0	-0.4	-30.0	-	-5.0	-414.0	00
Fulvio	7,809.0	-0.7	-59.0	-	-5.4	-443.0	00
Laurenzio	8,439.0	+7.3	+571.0	***	+2.3	+187.0	-
Midas	8,572.0	+8.9	+704.0	***	+3.9	+320.0	**
Tamino	8,985.0	+14.2	+1,117.0	***	+8.9	+733.0	***
Average	**8,252.0**	-	-		-	-	

Dl 5%=216.13 kg/ha Dl 1%=307.23 kg/ha Dl 0.1 %=444.86 kg/ha
Source: Own calculation.

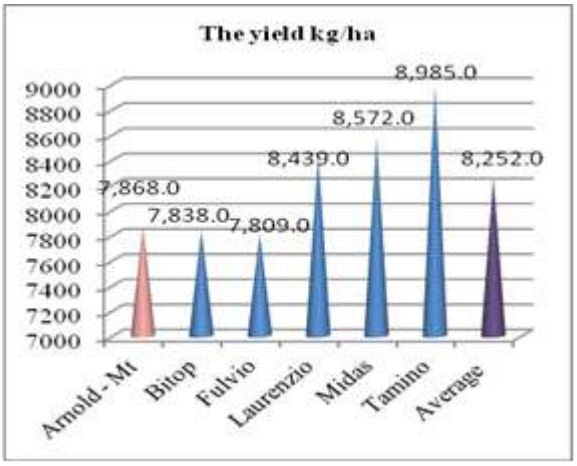

Fig. 1. Influence of varieties upon yield.
Source: Own calculation

CONCLUSIONS

Tamino and Fulvio varieties, recorded the highest protein content, 14.9%. Midas variety obtained the lowest protein content, 13.2%, below the witness value and the average value.

Fulvio variety recorded the hights content in gluten, 33.4% and Midas variety recorded the lowest content, 29.1%, which was the only variety that did not exceed the recorded variety and the average value.

Regarding the hectolitre weight, the highest value was recorded in Laurenzio variety, 81.6%. The lowest value was observed in Bitop and Tamino varieties, 75.7%, which are below the value of the control variety (78.1%) and the average (78.5%).

MMB exceeded the weight of 45 g for all varieties except for Fulvio variety, where MMB was 37.27 g, being the only one that did not exceed the calculated average value.

All varieties exceeded 7,800.0 kg/ha. The largest production belongs to Tamino variety, 8,985.0 kg/ha. The lowest yield was achieved in Fulvio variety, 7,809.0 kg/ha. This variety and Bitop variety had lower productions than those recorded in the control variety, but the differences were insignificant.

Very significant harvest differences were recorded by Laurenzio, Midas and Tamino varieties, production increases with values between 571.0-1,117 .0 kg/ha.

Compared to the average value, Arnold, Bitop and Fulvio varieties recorded distinctly significant negative productions. Midas variety made a distinctly significant harvest and Tamino variety was marked by a statistically significant increase (733.0 kg/ha).

All the tested varieties had good results, in the top being Tamino variety where the productions achieved, the protein and gluten content were balanced and superior to the other varieties.

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