

## STUDY REGARDING THE BEHAVIOR OF SOME VARIETIES OF WHEAT, IN ECOPEDOLOGICAL CONDITIONS, FROM THE SOUTH-WEST AREA OF DOLJ COUNTY

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### ABSTRACT

*The research aims at the comparative study of some varieties of autumn wheat in conventional cultivation system, in the conditions of the eutricpsamosol, from Poiana Mare, on an area of 300 ha cultivated with wheat, for a better knowledge of them, in order to the recommendation to cultivate in the area, the varieties that can express to the maximum, the productive and qualitative potential. For two years (2019 - 2020), within S.C. Primagrinar SRL Poiana Mare, Dolj were grown wheat varieties: MIRANDA, OTILIA - Romanian varieties and AVENUE, SORRIAL - French varieties. Regarding the obtained production, the Miranda variety registered the average value of 7800 kg / ha, and the Sorrial and Avenue varieties obtained an average production of 8050-8150 kg / ha. The high production of these French varieties is argued by the fact that they belong to the Premium group, very productive, very drought tolerant and with high ecological plasticity, with good resistance to wintering, falling, diseases and high twinning capacity, receptive to fertilizer doses, superior in terms of quality. The biological potential is very high reaching 11.000 kg / ha. Given the very high rainfall in June, when the plants reached physiological maturity, in both years of research, it was observed that foreign varieties lose their baking qualities very quickly, due to rains that "wash" gluten and reduce their hectoliter mass, which is not the case with Romanian varieties. Avenue, being extra early, was the most affected during the research period.*

### INTRODUCTION

Wheat is the most important cereal in the world, occupying the largest cultivated areas (Constantinescu et al., 2009). Simultaneously with the expansion of wheat cultivation worldwide, varieties capable of harnessing the ecological potential of each climate zone have been created (Bâlțeanu, 1999). Wheat grains are an important export product for large producing countries, suitable for trade, storage and relatively easy transport. Regarding the export of wheat, before the First World War, Romania occupied the 5th place in the world, in the period 1921-1925, the 10th place, in 1926-1928, the 8th place, and in 1931-1935, the 6th place (Ceapoiu, 1984). Romania was known as the "granary of Europe", given that domestic consumption was very low. The evolution from wild species with dressed beans, from which yields of several hundred kilograms per hectare were obtained and to modern varieties, which reached productions of over 10 tons per hectare, led to the formation of one of the most important plants culture in the world. In 2020, wheat production nationwide decreased by 40%

compared to 2019 and this is due to drought. Studies undertaken in Șimnic based on climatic data recorded in the last 40 years have shown that production is positively correlated with the increase of precipitation by up to 582 mm per year, after which production decreases (Păunescu et al., 1994).

The factors that determine the spread of wheat cultivation around the world are climate, soil and economic conditions. Each specific set of environmental conditions may correspond to another ideal genotype, given the complexity of the interactions within the plant-soil-weather system. Although ideal for one area, one variety may not correspond to another because, no matter how small it is in area, there is a variability of environmental conditions, in time and space. The identification of high-yielding wheat varieties for different agro-climatic conditions is important, because farmers rely largely on these varieties for cereal yields (Dunăreanu, Bonea, 2020).

## MATERIAL AND METHOD

The research aimed at the comparative study of some autumn wheat varieties in conventional cultivation system, under the conditions of eutric psamosol, from Poiana Mare, Dolj County, on an area of 300 ha cultivated with wheat, for a better knowledge of in order to recommend to cultivate in the area, the varieties, which can express to the maximum, their productive and qualitative potential. For two years (2019 - 2020), at S.C. Primagrinar SRL Poiana Mare, wheat varieties were cultivated: MIRANDA, OTILIA - Romanian varieties and AVENUE, SORRIAL - French varieties.

The tests on laboratory microprobes, at Fundulea and ISTIS, indicated that the Miranda variety has medium quality characteristics, but corresponding to the requirements of the standards of the milling and bakery industry. The Otilia variety has a very good baking quality, being from this point of view, superior to the Dropia variety, a quality control variety, in the official tests of the I.S.T.I.S., but also to the Glosa variety. (<https://diaplant.ro/produs/seminte-grau-miranda/otilia>).

In all areas of wheat cultivation in Romania, especially in the south and southeast, it is recommended to cultivate the Avenue variety, due to the fact that it reaches flowering, not maturity, before the arrival of very high temperatures, with the recommendation to be sown in autumn. quite early, optimum density: 370-400 germinating grains/m<sup>2</sup>. : ([https://www.lgseeds.ro/wp-content/uploads/2019/06/limagrain\\_catalog\\_actual.pdf](https://www.lgseeds.ro/wp-content/uploads/2019/06/limagrain_catalog_actual.pdf)).

Sorrial is a high quality semi-early wheat variety, unlisted, with a high production potential, which is suitable for the bakery segment. (<https://www.alcedo.ro/sorrial-soi-iscusit-de-grau-cu-calitati-superioare-segmentul-de-panificatie-recomandat-pentru-toate-zonele-de-cultura-ale-graului-din-romania/>).

Observations and determination:

In the field they were determined and noted in wheat:

- number of plants grown / m<sup>2</sup> - average of 2 counters, with metric frame with side of 0.5 m, when harvesting plants, calculated per m<sup>2</sup>.
- number of ears / m<sup>2</sup> - average of 2 counters, with metric frame with side of 0.5 m, when harvesting plants, calculated per m<sup>2</sup>.
- waist - the average of a bunch of plants placed on the line, from the soil surface to the top of the ear, without edges.
- production - 1 ha sample at 14% harvest humidity.

In the laboratory of the reception base the quality of the production was determined:

- grain moisture (%) - spectrophotometric method with NIR analyzer;
- protein content (%) - spectrophotometric method with NIR analyzer model INFRAMATIC 9200;
- Zeleny sedimentation index (ml) - spectrophotometric method with NIR analyzer model INFRAMATIC 9200;
- wet gluten content (%) - spectrophotometric method with NIR analyzer model INFRAMATIC 9200;
- drop index (seconds) - the system for determining the activity of alpha amylase, PERTEN model FALLING NUMBER 1310;
- MMB (relative mass of 1000 grains) (g); - by weighing 1000 grains on the KERN type digital electronic balance;
- MH (hectolitre mass) (kg / hl); - with the apparatus for determining the hectolitre weight.

An average sample of about 2 kg was used in the composition of the sample for analysis.

#### AGROPHYTOTECHNICAL MEASURES APPLIED IN THE AGRICULTURAL YEAR 2018-2019

- Precursor plant: wheat varieties were grown after sunflower (Miranda 60 ha; Avenue 70 ha), corn (Otilia 80 ha) and Sorrial 90 ha, after wheat.
- After harvesting the preceding plants, a passage was made with the shredder of vegetable residues, which also performed a mobilization of the soil, on a shallow depth (5 cm), to prevent the evaporation of water.
- Plowing was avoided and the hard disk (Hector) was intervened, at a depth of 20 cm, on the cultivated areas after sunflower and corn.
- A 25 cm plowing was carried out on the surface on which the Sorrial variety was sown, with the FENDT 718 Vario tractor, in the aggregate with the LemkenJuvel 7 M plow.
- DAP 10-40-16 complex fertilizers were administered, in an amount of 250 kg / ha, which were incorporated with a light disc (Heliodor).
- Preparation of the germination bed: a pass with the John Deere + LEMKEN Kompaktor tractor, before sowing.
- Seed and sowing: straw seed drills - Amazon D 9 - 4000.
- Certified seed was used in the varieties grown after sunflower and corn, treated with the fungicide Celeststar 1 l / t, to control diseases: common weeds, wheat embers, fusariosis, and in the Sorrial variety, grown in monoculture, seed treated with Austral insectofungicide plus 5 l / ton, which includes additional pest control - *Agriotesspp*, *Zabrustenebrioides*.
  - the sowing took place in 10 days, respectively October 5-15, 2018.
  - the following quantities of seed were used for sowing:
    - Miranda and Otilia: 280 kg / ha, respectively 550 bg / m<sup>2</sup>; at a depth of 5-6 cm.
    - Avenue: 180 kg / ha; Sorrial: 180 kg / ha, respectively 380 bg / m<sup>2</sup>, at a depth of 3-4 cm, because these varieties have a twinning knot more on the surface.
  - distance between rows: 12.5 cm.

#### Maintenance work

- Spring fertilization with:
  - urea 200 kg / ha (March 1-3), for the Miranda and Otilia varieties and on March 15-16, for the Avenue and Sorrial varieties (in order to avoid their excessive twinning);

- 150 kg / ha nitrocalcar (April 26-28);
- 150 kg / ha ammonium nitrate (May 6-7), for Avenue and Sorrial varieties.

Herbicide: after emergence, the herbicide Rival 75 GD (chlorsulfuron) was applied, 20 g / ha on November 13;

- Fighting diseases and pests:

Q1- 31.03. 2019 - applied herbicide Rival Super Star 75 GD 20 g / ha plus Cerlit 0, 4 l / ha associated with a treatment administered, for the prevention of the complex of foliar diseases (*Erysiphegraminis*, *Septoriatritici*, *Septorianodorum*, *Pucciniastriformis*, *Puccinia recondite*) - with Treoris 2 l / ha; Faster 10 EC 0, 15 l / ha;

- for the Sorrial variety the Medax Top growth regulator 0.6 l / ha was applied);

- at the same time the foliar fertilizer Microfert U, 3 l / ha was applied;

Q2 - 06.05.2019 - treatment applied in the bellows phase, with Acanto Plus 0.5 l / ha; Mospilan 20 SP, 0.1 kg / ha; Faster Gold 0, 15 l / ha;

- was administered concomitantly with the second treatment, Folimax Gold leaf fertilizer, 2 l / ha;

- for the Avenue and Sorrial varieties, the third treatment was performed with the product Nativo 300 SC 0.8 l / ha, to control the fusarium wilt of the ears;

• Harvesting was carried out immediately after the grain moisture reached 14.5%, with the CLAAS Lexion 620 combine, starting with July 1, 2019.

#### AGROPHYTOTECHNICAL MEASURES APPLIED IN THE AGRICULTURAL YEAR 2019-2020

• Precursor plant: wheat varieties were grown after sunflower (Otilia 75 ha and Sorrial 75 ha); corn (Avenue 100 ha and Miranda 50 ha).

• After harvesting the preceding plants, a passage was made with the shredder of vegetable residues, which also performed a mobilization of the soil, on a shallow depth (5 cm), to prevent the evaporation of water.

• Plowing was avoided and the hard disk (Hector) was intervened, at a depth of 20 cm, on the cultivated areas after sunflower and corn.

• DAP 10-40-16 complex fertilizers were administered, in an amount of 250 kg / ha, which were incorporated with a light disc (Heliodor).

• Preparation of the germination bed: a pass with the John Deere + LEMKEN Kompaktor tractor, before sowing.

• Seed and sowing: straw seed drills - Amazon D 9 - 4000.

- Certified seed was used, treated with the fungicide Celeststar 1 l / t, to control diseases: common weeds, wheat embers, fusariosis;

- the sowing took place in 10 days, respectively October 2-12, 2019.

- the following quantities of seed were used for sowing:

➤ Miranda and Otilia: 285 kg / ha, respectively 550 kg / m<sup>2</sup>; at a depth of 5-6 cm

➤ Avenue: 175 kg / ha; Sorrial: 170 kg / ha, respectively 380 kg / m<sup>2</sup>, at a depth of 3-4 cm, because these varieties have a twinning knot more on the surface.

- distance between rows: 12.5 cm;

Maintenance work

• Spring fertilization:

- urea 200 kg / ha (March 2-4), for the Miranda and Otilia varieties and on March 12-14, for the Avenue and Sorrial varieties (to avoid excessive twinning).

- 150 kg / ha nitrocalcar (April 22-26);

- 150 kg / ha ammonium nitrate (May 6-7), for Avenue and Sorrial varieties.
- after emergence, the herbicide Rival 75 GD (chlorsulfuron) was applied, 20 g / ha at 15 November.
- Fighting diseases and pests:
  - Q1- 31.03. 2020 - applied herbicide Rival Super Star 75 GD 20 g / ha plus Cerlit 0, 4 l / ha combined with a treatment administered, for the prevention of the complex of foliar diseases (*Erysiphegraminis*, *Septoriatritici*, *Septorianodorum*, *Pucciniastriformis*, *Pucciniarecondite*) - with Topsin 500 SC 0.6 l / ha; Bumper 250 EC 0,3l/ ha ; Faster 10 EC 0, 15 l / ha;
    - the Medax Top 0.6 l / ha growth regulator was applied to the Sorrial variety;
    - at the same time the foliar fertilizer Microfert U, 3 l / ha was applied;
  - Q2 - 04.05.2020 - treatment applied in the bellows phase, with MiradorXtra 0.5 l / ha; Mospilan 20 SP, 0.1 kg / ha; Faster Gold 0, 15 l / ha;
    - the foliar fertilizer Folimax Gold 2 l / ha was administered simultaneously with the second treatment;
  - T3 - treatment was applied with Nativo 300 SC products, 0.8 l / ha and Proteus OD 110 0, 4 l / ha, to control diseases and pests.
- Harvesting was carried out immediately after the grain moisture reached 15%, with the CLAAS Lexion 620 combine, starting on June 28, 2020.

## RESULTS AND DISCUSSIONS

### RESULTS REGARDING THE MORPHOLOGICAL CHARACTERISTICS OF CULTIVATED WHEAT VARIETIES

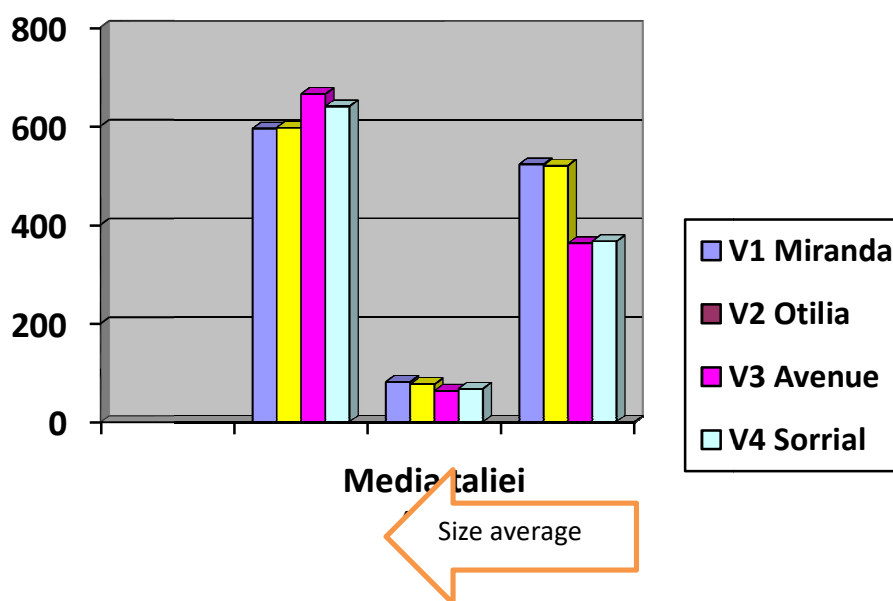
In the following will be presented the results regarding: the number of sprouted plants / sqm, the number of ears / sqm, the size, the mass of 1000 grains, the hectolitre mass, the weight of the grains / ear, the production, the protein content, the gluten content, in average for 2 years (2019 and 2020), on the eutricpsamosol from Poiana Mare, Dolj County. The number of sprouted plants / sqm had the average value between 366.0 plants / sqm for the Sorrial variety and 522.5 plants / sqm for the Miranda variety (table 1, graph 1). The number of ears / sqm ranged between 595 ears / sqm for the Miranda variety and 665 ears / sqm for the Avenue variety. The Avenue variety stood out, due to its very high twinning power in spring and very good adaptation to harsh conditions, for the autumn crops of the agricultural year 2018-2019. Also, through a significantly superior ability to form spikes, the productive potential is very high.

Regarding the height of the plants, the average value is between 63.0 cm and 81.0 cm. In conditions of lower precipitation (2020), the stress acted in the period from the elongation of the stem, to the increase of the ear. The smallest size was registered by the Avenue variety, being a genetic characteristic of the variety, having a small to medium size, and the highest value of 81.0 cm was registered by the Miranda variety, a high-sized variety. In the cultivation technology, a growth regulator was applied to the Sorrial variety - Medax Top (0.6 l / ha), at the beginning of the straw elongation - between the first and the second internode.

Table 1

### Morphological characteristics of cultivated wheat varieties

| No. crt.       | Variety | No.pl./m <sup>2</sup> |      | Average | No.spice /m <sup>2</sup> |      | Average | Size (cm) |      | Average |
|----------------|---------|-----------------------|------|---------|--------------------------|------|---------|-----------|------|---------|
|                |         | 2019                  | 2020 |         | 2019                     | 2020 |         | 2019      | 2020 |         |
| V <sub>1</sub> | Miranda | 535                   | 510  | 522,5   | 600                      | 590  | 595     | 82        | 80   | 81,0    |
| V <sub>2</sub> | Otilia  | 530                   | 510  | 520,0   | 602                      | 592  | 597     | 78        | 74   | 76,0    |
| V <sub>3</sub> | Avenue  | 360                   | 364  | 362,0   | 650                      | 680  | 665     | 64        | 62   | 63,0    |
| V <sub>4</sub> | Sorrial | 362                   | 370  | 366,0   | 610                      | 670  | 640     | 68        | 66   | 67,0    |



**Graph 1. Morphological characteristics of cultivated wheat varieties**

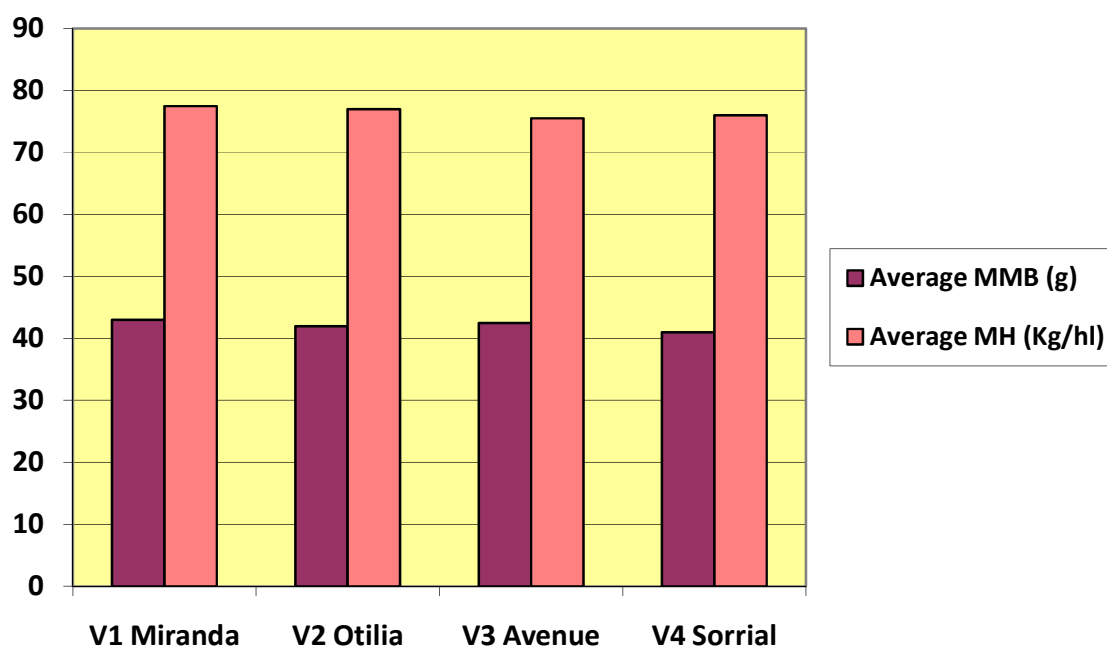
### RESULTS REGARDING MMB AND HECTOLITRIC MASS IN CULTIVATED WHEAT VARIETIES

From the point of view of the mass of 1000 grains, the Miranda variety registered the highest value - 43.0 g, and the lowest - the Sorrial variety 41.0 g. The differentiated climatic conditions in the two years, especially the agricultural year 2018 -2019 determined the appearance of some morphological characteristics atypical of the studied varieties. The hectolitre mass had values between 75.5 kg / hl for the Avenue variety and 77.5 kg / hl for the Miranda variety. Both varieties of foreign genetics showed inadequate values of these physiological indicators (table 2, graph 2).

Table2

**Mass of 1000 grains and hectolitre mass of cultivated wheat varieties**

| No crt         | Variety | MMB (g) |      | Average | MH (kg/hl) |      | Average |
|----------------|---------|---------|------|---------|------------|------|---------|
|                |         | 2019    | 2020 |         | 2019       | 2020 |         |
| V <sub>1</sub> | Miranda | 44      | 42   | 43,0    | 78         | 77   | 77,5    |
| V <sub>2</sub> | Otilia  | 43      | 41   | 42,0    | 76         | 78   | 77,0    |
| V <sub>3</sub> | Avenue  | 42      | 43   | 42,5    | 76         | 75   | 75,5    |
| V <sub>4</sub> | Sorrial | 42      | 40   | 41,0    | 77         | 75   | 76,0    |



**Graph2. Mass of 1000 grains and hectolitre mass of cultivated wheat varieties**

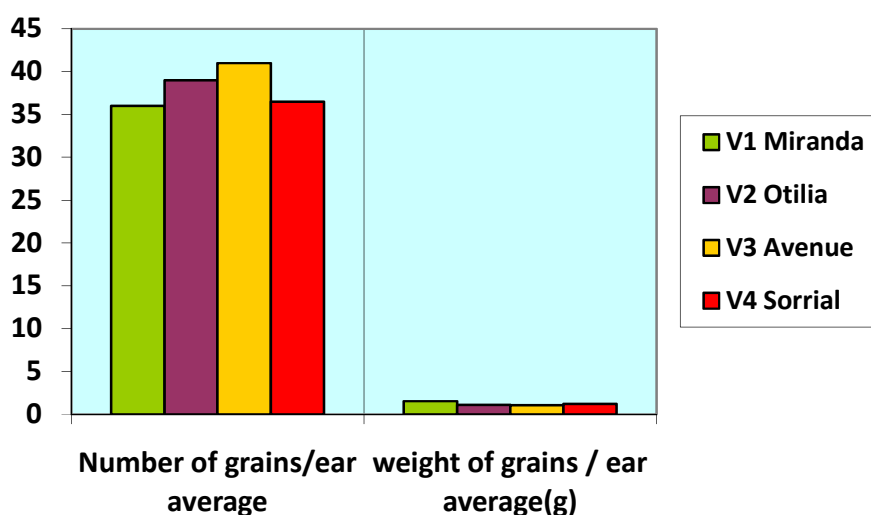
**RESULTS REGARDING THE NUMBER OF GRAINS / SPIC AND THE WEIGHT OF THE GRAINS / SPIC, IN CULTIVATED WHEAT VARIETIES**

From the point of view of the number of grains / ear, the average values were between 36.0 for the Miranda variety and 41.0 for the Avenue variety. Regarding the weight of grains / ear, the third element of productivity studied, the Avenue variety registered the lowest value of 1.05 g / ear, and the Miranda variety presented the highest value of 1.53 g / ear, which denotes that fertilization with high doses of nitrogen in drought conditions does not influence this character, regardless of variety (table 3, graph 3).

Table 3

**Number of grains / ear and weight of grains / ear for cultivated wheat varieties**

| No crt         | Variety | Number of grains / ear |      | Average | Weight of grains / ear (g) |      | Average |
|----------------|---------|------------------------|------|---------|----------------------------|------|---------|
|                |         | 2019                   | 2020 |         | 2019                       | 2020 |         |
|                | Years   |                        |      |         |                            |      |         |
| V <sub>1</sub> | Miranda | 38                     | 34   | 36,0    | 1,46                       | 1,60 | 1,53    |
| V <sub>2</sub> | Otilia  | 40                     | 38   | 39,0    | 0,97                       | 1,21 | 1,09    |
| V <sub>3</sub> | Avenue  | 42                     | 40   | 41,0    | 0,96                       | 1,14 | 1,05    |
| V <sub>4</sub> | Sorrial | 38                     | 36   | 37,0    | 1,30                       | 1,12 | 1,21    |



**Graph 3. Number of grains / ear and weight of grains / ear for cultivated wheat varieties**

**PRODUCTION RESULTS AND QUALITY CHARACTERISTICS FOR CULTIVATED WHEAT VARIETIES**

Regarding the obtained production, the Miranda variety registered the average value of 7800 kg / ha, and the Sorrial and Avenue varieties obtained an average production of 8050-8150 kg / ha. The high production of these French varieties is argued by the fact that they belong to the Premium group, very productive, very drought tolerant and with high ecological plasticity, with good resistance to wintering, falling, diseases and high twinning capacity, receptive to fertilizer doses, superior in terms of quality. The biological potential is very high reaching 11,000 kg / ha.

Given the very high rainfall in June, when the plants reached physiological maturity, in both years of research, it was observed that foreign varieties lose their baking qualities very quickly, due to rains that "wash" gluten and reduce their hectoliter mass, which is not the case with Romanian varieties. Avenue, being extra early, was the most affected during the



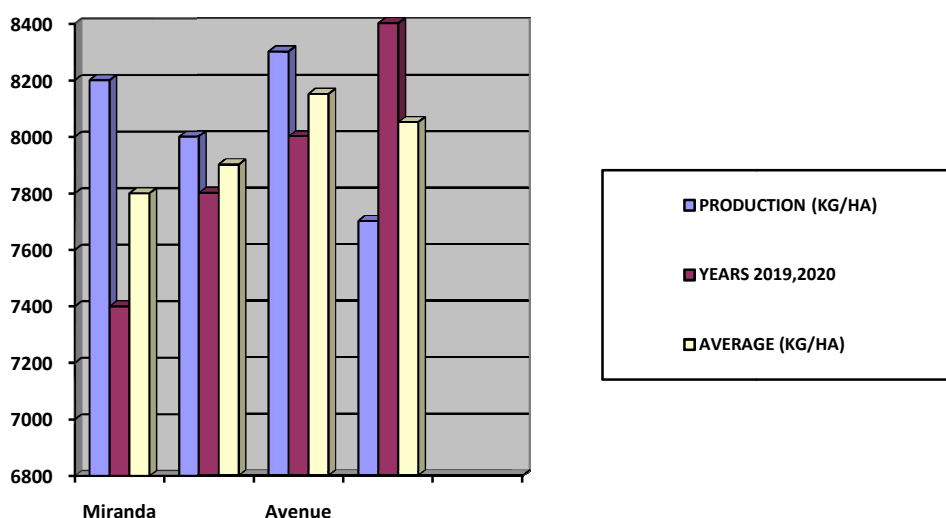
research period. From the point of view of protein content, a wheat has very good quality, when the values of this indicator are higher than 13%, good quality at values between 12-13%, satisfactory quality at values between 10-12% and quality unsatisfactory at values below 10%.

Flour with a low protein content is suitable for the production of snacks and cakes. High protein flour is recommended for products with a rough texture, such as bread. Bakers use the results in terms of protein content to anticipate water absorption and dough development time during processing and production, because a high content normally requires more water and a longer mixing time, so that the dough to obtain the optimal consistency (table 4, graphs 4; 5).

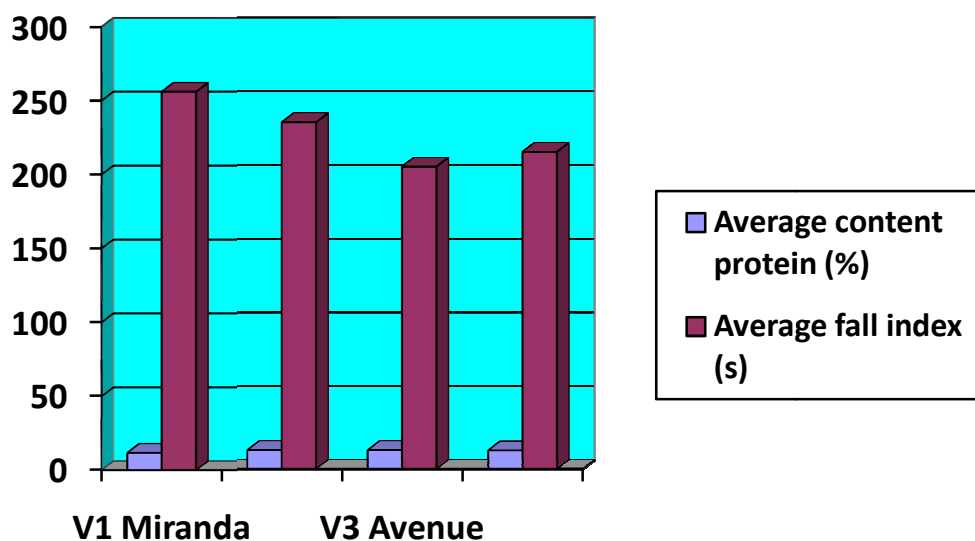
Table 4

**Production, protein content and fall index for cultivated wheat varieties**

| No.crt         | Variety | Production (kg/ha) |      | Average | Protein content (%) |      | Average | Fall index(s) |      | Average |
|----------------|---------|--------------------|------|---------|---------------------|------|---------|---------------|------|---------|
|                |         | 2019               | 2020 |         | 2019                | 2020 |         | 2019          | 2020 |         |
|                |         | 2019               | 2020 |         | 2019                | 2020 |         | 2019          | 2020 |         |
| V <sub>1</sub> | Miranda | 8200               | 7400 | 7800    | 11,0                | 12,5 | 11,7    | 250           | 262  | 256     |
| V <sub>2</sub> | Otilia  | 8000               | 7800 | 7900    | 12,5                | 13,0 | 12,7    | 240           | 230  | 235     |
| V <sub>3</sub> | Avenue  | 8300               | 8000 | 8150    | 12,0                | 13,5 | 12,7    | 210           | 200  | 205     |
| V <sub>4</sub> | Sorrial | 7700               | 8400 | 8050    | 13,2                | 11,8 | 12,5    | 220           | 210  | 215     |



**Graph 4. Production of cultivated wheat varieties**



**Graph 5. Protein content and fall index of the studied wheat varieties.**

The most important method in quickly assessing the quality of wheat seems to be the sedimentation test. Research has shown that the sedimentation test is closely correlated with the volume of the bread, the farinographic note, the gluten index and the crude protein content and less closely between them and the Pelsenke index and the extensographic note.

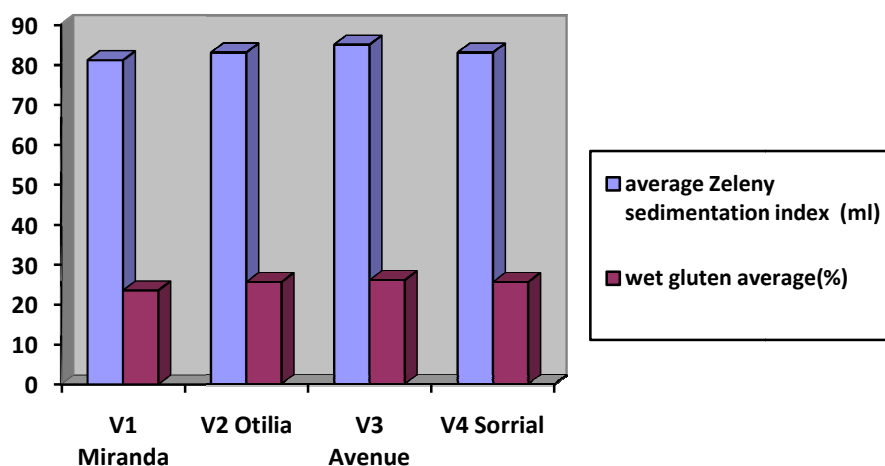
Both the Zeleny sedimentation index and the gluten index correctly express the quality of wheat baking. These indices associated with the farinographic note and the volume of the bread constitute the basic elements in the appreciation of the quality of the wheat for bakery.

A flour considered good must have a sediment over 60 ml. The higher the sediment value, the better the gluten content, so the flour is good (table 5, graph 6). Values can be from 20 or less for low protein wheat, which has low gluten to values of 70 and more, for high protein grains with high gluten.

*Table 5*

**Sedimentation index and wet gluten in the studied wheat varieties**

| No.crt.        | Variety | Sedimentation index Zeleny (ml) |      | Average | Wet gluten(%) |      | Average |
|----------------|---------|---------------------------------|------|---------|---------------|------|---------|
|                |         | 2019                            | 2020 |         | 2019          | 2020 |         |
| Anii           |         |                                 |      |         |               |      |         |
| V <sub>1</sub> | Miranda | 80                              | 82   | 81      | 22            | 25   | 23,5    |
| V <sub>2</sub> | Otilia  | 82                              | 84   | 83      | 25            | 26   | 25,5    |
| V <sub>3</sub> | Avenue  | 84                              | 86   | 85      | 25            | 27   | 26,0    |
| V <sub>4</sub> | Sorrial | 86                              | 80   | 83      | 27            | 24   | 25,5    |



**Graph 6. Average sedimentation index and Zeleny index in cultivated wheat varieties.**

The wet gluten content was initially considered to be the most eloquent qualitative parameter of wheat flour (STAS 90-88). In general, a high gluten content is an indication that the flour has good baking properties. A good quality gluten must be well agglomerated, quite resistant and elastic. In order for the flour to be used in baking, it is necessary for the wet gluten to be higher than 26%. If this value is not reached, wheat flour should be improved with the addition of vital gluten. Gluten is responsible for the elasticity and extensibility of the flour. The wet gluten content reflects the protein content and is a specific requirement of flour, demanded by end users of the food industry. A flour is appreciated to have a very good quality, at a wet gluten content over 26%, good quality at 24-26% wet gluten, satisfactory quality at 22-24% wet gluten and unsatisfactory quality, at values of gluten content wet below 22%. With the exception of the Miranda variety, which has medium baking characteristics, regarding the degree of appreciation, the other varieties, respectively Otilia, Avenue and Sorrial, fall into the category of qualitatively good wheat varieties.

## CONCLUSIONS

1. The high winter survival capacity is a requirement for the stability of production for winter wheat.
2. The number of leaves, the strong twinning and the scattered crown are also competitive features.
3. A valuable variety must be characterized by good phenotypic stability, regardless of the environmental factors that act.
4. The phenomenon of drought escape and avoidance plays an important role in adapting to specific environmental conditions.
5. Precocity is another important feature of wheat varieties, it allows a better

correspondence between the critical stages of plant development and periods with more favorable climatic conditions, which reduces the risk of losses caused by drought and heat.

6. An important criterion on the basis of which drought-tolerant plants can be sorted is the size and weight of the grain.
7. Drought affects the size to a greater extent, compared to the mass of 1000 grains.
8. The components responsible for reducing production, in conditions of low rainfall, was the number of ears as affected as the survival rate of the siblings.
9. Differences in wheat precocity are mainly determined by the varied requirements for vernalization and photoperiod.
10. The precocity and the duration of the grain filling period are characteristics, which determine the weight of the grain, the mass of 1000 grains being significantly higher, in the plants with the earlier anthesis date.
11. The harvest, the number of grains in the ear, the biomass and the height of the plants proved to be more thermosensitive than the number of ears per unit area and mass of 1000 grains.
12. The optimal combination of vernalization and photoperiod requirements, which ensure the highest yields, differs considerably from one year to another, depending on both the water regime and the thermal regime.
13. The protein content of wheat grain largely depends on: wheat variety, cultivation technology (irrigated, non-irrigated, fertilization) and soil and climatic conditions.
14. A high protein content is associated with a good baking quality. Among the technological factors, fertilization influences the strongest protein in the grain.
15. The wet gluten content and the fall index are favorably influenced by the application of nitrogen fertilizers.

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