

IOSUD – UNIVERSITATEA „DUNĂREA DE JOS” DIN GALAȚI

Școala doctorală de Științe fundamentale și ingineresti



TEZĂ DE DOCTORAT

RESEARCH ON THE INFLUENCE OF PEDOCLIMATIC FACTORS ON THE PRODUCTION AND QUALITY INDICES OF THE SEEDING WHEAT IN BRĂILA COUNTY

SUMMARY

Doctorand,

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Seria I9 Nr. 1

GALAȚI

2019

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SUMMARY DOCTORAL THESIS

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ON THE PRODUCTION AND QUALITY INDICES OF THE SEEDING WHEAT
IN BRĂILA COUNTY**

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Seria I9 Nr. 1

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2019

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- Seria M: **Medicină**

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List of abbreviations

- MADR** - Ministry of Agriculture and Rural Development
- ISTIS** - State Institute for Variety Testing and Registration
- INCS** - National Inspection for Seed Quality
- ITCSMS** - Territorial Inspectorates for the Quality of Seeds and Planting Material
- LCCSMS** - Central Laboratory for Seed Quality and Planting Material
- INS** - National Institute of Statistics
- GNIS** - Groupement National Interprofessionnel des Semences et Plants (French National Interprofessional Group for Seeds and Plants)
- INCDA** - National Agricultural Research and Development Institute
- HG** - Government Decision
- CPVO** - Community Plant Variety Office
- ASAS** - The Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Șișești"
- AEM** - European Environment Agency
- SCDA** - Agricultural Research and Development Station
- BOPS** - Official Gazette for Variety Protection

Constanța Băcanu (Șerban)

Research on the influence of pedoclimatic factors on the production and quality indices of the seeding wheat in Brăila county

INTRODUCTION

At the national level, the seed production from a technological point of view is carried out according to the specific technologies developed by the variety breeder / hybrid breeder, and from the point of view of the legislation in the agricultural field is subject to the latest legal regulations aligned with the European Union norms.

Obtaining a quality seed with higher indices, as well as maintaining the genetic traits of the variety, is achieved by using special techniques and methods, technologies established after scientific studies and researches. The certified seed is the basis for the development of agricultural production regulated by Law 266/2002, republished in the Official Gazette, no. 239 of April 3rd, 2014 on the production, processing, control and certification of quality, marketing of seeds and planting material, as well as testing and registration of plant varieties.

The purpose of the research paper on the behaviour of some wheat varieties in the pedoclimate conditions of Brăila county is to identify the most valuable varieties that have stability and normal development of plants, both under soil conditions with neutral pH or weak alkaline, and with drought and excess precipitation. The theme was chosen with the aim of reducing production fluctuations and obtaining the best quantitative and qualitative indices, under the conditions of applying very rigorously executed technological links without which the creation of seed lots is not possible.

The objectives of the research regarding the determination of the causality relation between the quality of the soil and the yield of the sown wheat variety:

- 1. Evaluation of the resistance to change of the seed material according to the capacity of acclimatization to the local pedoclimate conditions of the French wheat variety;***
- 2. Comparison of the productive capacities of the French varieties with the indigenous varieties in relation to the local pedoclimate conditions and the standard productive capacity described in the Official Catalogue of the varieties;***
- 3. Evaluation of the superiority of the productive yield of the French wheat varieties in relation to the Romanian varieties under similar pedoclimatic conditions;***
- 4. Evaluation of the superiority of the qualitative indices of the French wheat varieties in relation to the Romanian varieties under symmetrical pedoclimatic conditions.***

The concerns regarding the production of certified seeds represent an important activity being an important matter both to the specialists in the field and to the farmers who deal directly with the multiplication, processing and trade of seeds. The multiplication of wheat seeds, nationally and in Brăila county is a very valuable segment of agriculture, ensuring the need for seed at national level as well as for export to the European Union and outside the EU.

Currently the areas cultivated with wheat for consumption in Romania are approx. 2.1 million hectares with an average wheat production of 4803 kg/ha, and the surface occupied with seeding wheat of about 70 thousand hectares' common wheat and 18 thousand hectares' durum wheat. Considered one of the most important plants, wheat cultivation in our area shows an alternation, from year to year, in terms of surfaces, productions, cultivated varieties, mainly conditioned by pedological and climatic factors.

Constanța Băcanu (Șerban)

Research on the influence of pedoclimatic factors on the production and quality indices of the seeding wheat in Brăila county

The experimental researches were carried out between 2016 and 2018, in four agricultural areas in Braila county, respectively the localities of Gemenele, Tudor Vladimirescu, Rîmnicelu and Movila Miresii, in which the cultivated varieties find favorable pedoclimatic conditions, on the topic „Research on the influence of pedoclimatic factors on production and quality indices of the seeding wheat from Brăila county”.

Research has been carried out on the soils and varieties of cultivated indigenous and foreign wheat, which are of great impact, both in order to obtain high seed yields, but also on the quality indices of the grains.

For this reason, under the competent guidance of Prof. PhD. Eng. Ec. Habil. Silviu Stanciu was approached this topic, to bring a contribution to the establishment of varieties, which are grown in a favorable area, with rigorous technology and biological purification works to give economically motivated crops.

The research paper is structured on five chapters and four annexes.

Chapter 1 presents a brief history of wheat cultivation and the current state of knowledge at the global and national level, as well as the surface sown with common wheat *Triticum aestivum ssp. vulgare*, allocated worldwide and nationally and contains a number of 1 table and 8 figures;

Chapter 2, entitled "Multiplication and certification of seeding wheat lots in Romania and in Braila county", presents the legislative aspects of national law, European legislation in the field of authorization, production and certification of economic agents, as well as current research on the evolution of surfaces and production multiplied and certified at national and local level, and comprises 7 tables and 12 figures.

Chapter 3 contains a number of 3 tables and 20 figures and presents the description of the materials used in the field and in the laboratory and of the methods according to the standards. The climatic conditions of the period 2016-2018, as well as the soils and the eight varieties used were analysed.

Chapter 4 contains 74 figures and presents the technology of producing seeding wheat lots in the field. In the laboratory and in the field analyses were performed on: number of wheat ears/m², number of grains/wheat ear/, MMB (g), production kg/ha, humidity (%) and germination (%).

Chapter 5 contains a number of 65 tables and 17 figures and presents the modelling of the experimental data obtained, using the Anova method, which compares at the same time the averages of several lots.

The paper has a total of 240 pages, 76 tables and 131 figures.

There were consulted and cited 110 bibliographic titles, of which 66 from the last 10 years.

SUMMARY

The dissertation is structured on two main sections:

Part I - theoretical substantiation

Chapter 1 - Current state of knowledge

Chapter 2 - Multiplication and certification of seeding wheat lots in Romania and in Braila county

Part II - own researches

Chapter 3 - Materials and methods used

Chapter 4 - Preliminary tests performed in the analyzing laboratory

Chapter 5 - Modeling of experimental data obtained

Keywords: seeding wheat, varieties, soils, sowing technology, production, quality indices

The theme of the dissertation addresses a current problem, of great importance for Brazilian farmers, the cultivation of eight varieties of indigenous and foreign wheat, on four different soils, destined for seed lots. In this context I integrate the research conducted in the dissertation entitled "Research on the influence of pedoclimatic factors on the production and quality indices of the seeding wheat in Brăila county".

Chapter 1 "Current state of knowledge" presents a brief history and current state of knowledge at global and national level.

Concerns over wheat cultivation date back to the Neolithic period, remains of whole wheat ears, little ears, glumes and wheat grains being found in the Middle East. In Romania, wheat culture has been known since ancient times, archaeological researches from Cucuteni, Iasi county, have shown that wheat was cultivated from the Neolithic period up to the Bronze Age (3000-1000 BC).

Wheat belongs to the Kingdom of *Plantae*, Phylum *Magnoliophyta*, Class *Monocotyledonopsida*, Order *Graminalis*, Family *Gramineae*, the genus *Triticum*, being the most cultivated plant in the world and the fourth world crop in terms of production after sugar cane, corn and rice.

The large crop surfaces and the importance for human nutrition are due to the high content of grains in carbohydrates and proteins, to a ratio of these components according to the requirements of the human body, long grain preservation, storage and transport in good condition, at convenient costs or to a degree of high ecological plasticity of the plant, which allow the cultivation in areas with variable relative climate, of different soils or by using some possibilities of integral mechanization of the crop and of the capacity of integration in almost all agricultural crop rotation systems. As cultivated varieties, at national level, the most widespread are common wheat (*Triticum aestivum ssp vulgare*), mainly used for baking, which occupies 90% of the area cultivated with wheat and durum wheat, also called amaut, or hard wheat (*Triticum durum / Triticum turgidum conv. Durum*), used especially for the preparation of pasta (Băcanu et al., 2017).

The official catalog of varieties of Romanian crop plants for 2018 includes for wheat 102 varieties of *Triticum aestivum L.emend. Fiori et Paol*, of which 28 varieties radiated and 3 varieties respectively of *Triticum durum Desf.*, (ISTIS, 2018). The State Institute for Variety Testing and Registration (ISTIS) represents the national authority in the field of examination of new plant creations, for registration in the Official Catalog of varieties or in the Register of varieties of crop plants. The most cultivated indigenous varieties of wheat are: Alex, Apullum, Dropia, Eliana, Glosa, Izvor, Litera,

Magistral, FDL Miranda, Rapid, Romulus, Rubin, Turda 95, and of durum wheat varieties Durom, Pandur, Rodur (Farm, 2009).

The registration of a variety in the Official Catalog can be renewed if, following DUS test, the variety is still distinct, sufficiently uniform and stable, retaining the same characteristics as when registering. Applications for re-registration must be submitted to ISTIS 2 years before the registration expiration date. In order to perform the DUS test (distinctiveness, uniformity, stability), the agro-technological procedures used in the Agronomic Value and Use test will be respected.

The official catalog of varieties of Romanian crop plants for 2018 includes for wheat 102 varieties of *Triticum aestivum L.emend. Fiori et Paol*, of which 28 varieties radiated and 3 varieties respectively of *Triticum durum Desf.*, (ISTIS, 2018)

The autumn wheat has a vegetation period of about 270 days from germination to maturity, (about 9 months) and that of spring wheat between 90-120 days. The wheat seed or caryopsis comes from a monocarpellary ovary and has a single seed grown with the fruit. Any complete seed is made up of: seminal tegument, endosperm and embryo (Savulescu, 2009).

The autumn wheat can be cultivated in our country under very favorable conditions on 19.5% of the arable area, favorable on 70.4% and slightly favorable on 7.2% (Bîlteanu, 1967).

The area sown with wheat, allocated worldwide is over 220 million ha. At national level, the area cultivated with wheat for consumption is 2.1 million hectares with an average wheat production of 4803 kg / ha. In Romania the area cultivated with wheat represents about 25% of the arable area and over 40% of the area sown with cereals. According to Vasilescu et al. (2010), plant crops represent an important variant of land use in Romania.

Chapter 2 "*Multiplication and certification of the seeding wheat lots in Romania and in Braila county*" presents the legislative aspects of the national legislation, the European legislation in the field of authorization, production and certification of economic agents, as well as the current researches regarding the evolution of the surfaces and the production multiplied and certified at the national and local level. According to Rotaru et al., (2005) to ensure the need for quality seeds a special homogenous policy, was and is required, in the field of agricultural seeds, which would meet the needs of all farmers as well as the increased requirements regarding food safety, traceability, but also the increased importance of environmental issues.

The cereal seeds produced by farmers can have different destinations: food or feed consumption (for animals), industrialization and multiplication by setting up seed lots. The genetic material is the main element in the sizing of the crops, its value being given by the fact that the seed provides the population with necessary agricultural products and stores in a very small space a huge volume of energy and genetic information (Cristea, 2006).

At national level, the agricultural sector is regulated by Law 266/2002, republished in the Official Gazette, no. 239 of April 3rd, 2014 on the production, processing, control and certification of quality, marketing of seeds and planting material, as well as testing and registration of plant varieties.

According to Order 59/2011, the procedure regarding the authorization and certification requirements comprises two very important stages:

- verification of the technical-material endowment (land, agricultural machinery, irrigation systems)
- certification of the personnel of the service provider.

A seeding wheat lot can be entered for multiplication if the "Multiplication Statement" is accompanied by the following documents:

- the multiplication agreement, in writing, of the designated authority to the one who intends to multiply the seed;
- the multiplication contract between the economic agent and the multiplier (if applicable);
- the quality and compliance document of the supplier attesting the origin of the seed, the quantity sown, the biological category, the treatment, the germination, the purity;
- all official labels;

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- the official description of the varieties according to the protocols of the Community Plant Variety Office (CPVO) or the International Union for the Protection of New Plant Varieties;
- self-declaration regarding the pre-preliminary culture,
- layout plan of the culture.

At the national level, the area multiplied with common seeding wheat registered the value of 69,871.9 hectares and 18,009 hectares with durum wheat, and at the local level 3,937.45 hectares the Glosa variety dominates the top of the surfaces with 1,313 hectares. To reduce crop losses and variability, determined by unfavorable factors from the biotic and abiotic environment, farmers prefer to cultivate indigenous varieties adapted to the pedoclimatic conditions in Romania, varieties that ensure safe and quality yields (Băcanu et al., 2019).

According to Order 1262 / 2005, in order for a culture to be "Admitted" in the field it must comply with the following requirements:

- be compatible with seed production;
- free of foreign plants from the previous culture (samulastra);
- free from diseases and pests.

A seeding wheat crop can be registered for certification if the "Certification Statement" is accompanied by mandatory documents: Seed marketing authorization endorsed for the current year; Field Inspection Document with the decision "Admitted"; The multiplication agreement from the maintainer granting the right to commercialize or his own necessities, through a contract or written agreement, to the economic agent; Processing contract with an authorized agent; Transport certificates issued by the authorities (ITCSMS or LCCSMS) filled in with the quantity of wheat harvested.

In 2018, at the local level, the top of the farmers' preferences is the Romanian wheat variety Glosa, the creation of the Agricultural Research and Development Institute from Fundulea, which covers an area of over 1000 hectares, registering an increase of 75 hectares compared to 2017. The gradual accumulation of genes that result in high production capacity, due to the use for improvement of diverse germplasm and the selection made under often contrasting environmental conditions, was reflected in the continuous growth of the production potential of the newly created varieties (Săulescu et al., 2007).

Chapter 3 "Materials and methods used in research", presents the climatic conditions from 2016-2018, the description of the soils and the eight varieties, Romanian and foreign used.

The climate in Romania is temperate-continental, marked by some oceanic, continental, Scandinavian-Baltic, sub-Mediterranean and Pontic climatic influences, with annual instability. Brăila County is characterized by a temperate continental climate, with arid tint.

The weather is characterized by the totality of quantitative and qualitative determinations of the different state properties of the atmosphere as well as on the physical processes that occur in the atmosphere, called meteorological elements: solar radiation (this element being also the main climatogenetic factor), temperature, pressure, wind, humidity, cloudiness and precipitation.

The analysis of the evolution of rainfall in Romania during 2016-2018, shows that the summer season is becoming increasingly drought, and the extreme weather causes very high losses in agriculture. The annual amount of precipitation in 2018 registered the value of 393.8 mm, small compared to the previous years, 2017 when the amount of precipitation registered the value of 550.5 mm and in 2016 the value of 531,5 mm.

Water is the most important element of life, but only a very small part of the total is directly usable for feeding the population and its use in different areas (Constantin et al., 2009).

In the period 2016-2018 from the analysis of the humidity of the air, we observe large oscillations from one month to another and from one year to another.

The air temperature represents a distribution with the altitude which influences of the solar radiation and the soil temperature. This evolution is justified by increasing the share of lost radiation

(terrestrial radiation) in relation to the one received (global radiation), as a consequence of reducing the quantity of water vapor and other elements of the air that can contribute to the absorption of radiation and thus to air heating (Enache, 2009).

From the analysis of the evolution of soil temperatures in the period 2016-2018, the year 2016 registered the highest annual average of 14.47° with 1.7°C lower than in 2018.

In the period 2016-2018 from the analysis of the average annual temperatures, there is a tendency to increase, so that in 2018 the average annual temperature registered higher values (with hot and dry summers) compared to the previous years. Rising temperatures associated with drought could force the growth processes and, implicitly, decrease the accumulation of reserve substances in the grain, which will have the effect of reducing crop yields. The main source of air heating is the earth's surface (land and water) where part of the solar radiation is reflected and the other absorbed, transformed into caloric radiation and transmitted upward to the air and down to the ground (Povara, 2006).

The brightness duration of the sun registered the highest value in 2018, summing a number of 2028.8 hours, with a minimum in January of 31.2 hours and a maximum of 319.7 hours in August, 1984.7 hours in 2017 and 2020.8 hours in 2016.

The classification of the soils from Braila county was based on the pedological mappings, so they could be classified by quality into 5 classes; very good, good, medium, weak and very weak.

The researches were carried out in the Plain of Braila, the northeastern sector of Bărăgan in the communes: Gemenele, Rîmnicelu, Movila Miresii and Tudor Vladimirescu. The specific relief of the zones is made up of smooth fields, between 20 and 50 m altitude generated by river-lake cones, covered with a thick loess layer (Ilenicz et al., 2005).

The soil in the Gemenele area - has a good quality, corresponding to the second class and a reserve of humus, which ensures good agricultural production. According to Tarau et al. (2014), each soil class describes between 1-5 genetic types, totaling 29.

The soil in the Rîmnicelu area - has a medium quality, which corresponds to the third class - having a small reserve of humus which ensures medium production. From a chemical point of view, the soil's pH has a very low alkalinity (7.4), the groundwater is at a shallow depth. The soil has a coarse texture having coarse-fine, clay-coarse and fine sand.

The soil in the Movila Miresii region - has a medium quality, which corresponds to the third class and the production capacity is medium with very little humus reserve. From a chemical point of view, the soil's pH has a low alkalinity (7.9). The soil class corresponding to the area is Salsodisoluri, with the representative soil types Solonceac and Soloneț. The salts characterized by the presence of soluble salts in the upper part of the soil profile are called solonceacuri.

The soil in the Tudor Vladimirescu area - has a medium quality, corresponding to the third class, with moderate humus reserves and total nutrients, ensuring medium production. From a chemical point of view, the pH is variable, from moderate to very high alkaline values. The soils are represented by wet phreatic chernozoms, cambic chernozoms, of depression and gleyed alluvial soils.

Soil is a very important component for agricultural plants, because it is a support as well as a reservoir of important nutrients in plant growth and development, being the most valuable asset of a country (Băcanu et al., 2018). Soil formation is a long-term complex process.

The autumn wheat is grown in almost every area of culture in the country, but the best results are obtained on fertile and permeable soils, under a good water supply and in the absence of extreme temperatures of scorch and drought. It should be avoided to sow on sandy soil, strongly eroded or the one frequently subjected to watering (Păcurar, 2007).

"The variety (cultivar, variety) represents a group of plants belonging to a botanical taxon of the lowest known rank", according to Law 266/2002 on the production, processing, control and certification of quality, marketing of seeds and planting material, as well as the registration of varieties of plants, which must meet the following criteria (DUS):

- distinctiveness (individuality, identity), conferring a certain particularity, different from another cultivar;

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- uniformity (homogeneity) through the similarity regarding the main characteristics of the group of individuals that make up the cultivar;
- stability by maintaining the successive reproductions of the characters and traits of identity and homogeneity.

In order to highlight the distinctiveness, uniformity and stability of the varieties (DUS), the eight varieties were analyzed from the point of view of morphological characters but also from the point of view of the productive potential:

Glosa - created by the National Agricultural Research and Development Institute Fundulea obtained from the complex hybrid combination Delabrad "S" / Dor "S" // Bucur by separate selection following rapid homozygote in the Zea system. The variety has a semi-erect bush with an average height of 85-95 cm, the ear is with aristae of white color and with cylindrical shape and the grains have a red color with a TGW between 42-43 g and a standard mass per storage volume between 76-79 kg / hl. . The variety has good resistance to fall, wintering, drought, scorch and wheat ear sprouting

Litera - created by the National Agricultural Research and Development Institute Fundulea obtained from the complex hybrid combination ERYT26221 / 96869G1 - // GLOSA by separate selection following rapid homozygote in the Zea system. The half-leaning to leaning bush with the average height of 95-105 cm, the ear is with aristae of white color and with pyramid shape and the grains have an elongated shape of medium size, the red color with a TGW between 42-45 g and a standard mass per storage volume between 77 -79 kg / hl. The variety has good resistance to fall, winter, drought and heat. From the disease point of view, the Litera variety has resistance to *Puccinia recondita f.sp.tritici* (brown rust) and average resistance to *Puccinia striiformis* (yellow rust) and *Erysiphe graminis f.sp.tritici* (powdery mildew).

FDL Miranda - this variety is created by the National Agricultural Research and Development Institute Fundulea made from the complex hybrid combination ERYT26221/96869G1-//GLOSA by separate selection following a rapid homozygote in the Zea system. The variety has a semi-erect bush with an average height of 100-110 cm. The ear is with aristae, and the beans have an elongated shape of medium size, the red color with the TGW between 42-44 g and the standard mass per storage volume between 78-80 kg/hl. From a disease point of view, the FDL Miranda variety has resistance to *Erysiphe graminis f.sp.tritici* (powdery mildew) and to the sensitive environment to *Puccinia recondita f.sp.tritici* (brown rust), *Puccinia striiformis* (yellow rust) and *Septoria tritici* (Septoria).

Izvor - this variety is created by the National Agricultural Research and Development Institute Fundulea obtained by sexual hybridization preceded by individual selection reiterated from the hybrid combination Karl/201R2-111//508U1-1. The variety has a half-leaning to leaning bush with an average height of 90-105 cm. The ear is with aristae, semi-lax of white color and pyramidal in shape and the grains have an elongated shape of medium size, of red color with the TGW between 40-45 g and the standard mass per storage volume between 77-79 kg / hl. The variety has a very good resistance to drought and good resistance to fall and winter. From the point of view of diseases, the Izvor variety has good resistance to *Puccinia recondita f.sp.tritici* (brown rust) and *Septoria tritici* (septoria), medium resistant to *Puccinia striiformis* (yellow rust) and *Erysiphe graminis f.sp.tritici* (powdery mildew).

Sorrial is a French variety, appearing for men, but for Caussade Semences. The variety is well adapted to the pedoclimatic conditions in Romania, good resistance to frost and fall. The variety is well adapted to the pedoclimatic conditions in Romania, good resistance to frost and fall.

Solveig is a French variety, there are also men who can be provided and nature care can be adapted to all soil types. Due to their medium waist, they have very good fall tolerance and high twinning capacity. The variety is almost statistical stature of medium size and with early signification. It has good resistance over winter to frost and winter. Solveig are well resistant to *Fusarium spp* (fusariosis) and medium to *septoria tritici* (septoriosis) and *Erysiphe graminis f.sp.tritici* (flouring).

Apache is a French variety, creates the company Limagrain Verneuil Holding. The variety is almost statistical, it adapts a culture in all areas of Romania, presenting the resistance to frost. Due to the medium waist, I have a very good tolerance for fall. Variety of good resistance to *Puccinia recondita f.sp.tritici* (brown rust), *Puccinia striiformis* (yellow rust) and *Septoria tritici* (septoriosis) and

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medium resistance to *Erysiphe graminis f.sp.tritici* (flour). At national level, constantly, production between 7000 and 9500 kg / ha (Ferma, 2011).

Avenue - is a French wheat variety, not listed, being the best-selling wheat variety after the Romanian ones and due to its medium size it has a very good tolerance to fall. It is recommended to cultivate in all areas of culture, especially in the south and south-east of Romania, due to the fact that it reaches the flowering period before the arrival of very high temperatures.

The wheat variety sown in the field, has to adapt as much as possible to the climatic conditions (to withstand drought and frost conditions) and to the soil on which it is cultivated, acclimating even on soils with low fertility, so that the quality and the production obtained to be as large as possible. The choice of these wheat varieties must be made taking into account all these factors (BASF, 2017)

Chapter 4, "Preliminary tests performed in the analysis laboratory", presents the technology of producing seeding wheat lots and the results of the laboratory analyzes regarding: number of ears/m², number of grains/ear/, TGW (g), production kg/ha, humidity (%) and germination (%).

During the field researches, in the wheat vegetative period, observations were made regarding the development of the plants, the degree of twinning, the number of ears / square meter, the number of grains in ear for each variety, estimating the production:

Within the technology, the eight varieties were sown, with the SUP 29 seed drill in the second half of October. In these experiments, the preceding plant was maize for all the varieties from the four areas Gemelele, Tudor Vladimirescu, Rîmnicelu and Movila Miresii. Soil works were carried out immediately after the corn was harvested. The plowing was done with the plow in aggregate with star disk harrow at a depth of 18-22 cm, with the incorporation of plant remains and weeds.

Fertilization was performed uniformly with complex fertilizers containing nutrients, for plants N:P:K, (20-20-0) the most balanced ratio for wheat. Complex fertilizers are more concentrated in nutrients than simple ones and the coefficient of use of nutrients in complex fertilizers is higher than in simple fertilizers (Gazeta de agricultura, 2016).

The wheat seeds used in sowing belonged to the C1 Certified biological category, and were treated with the Celest Star 025FS fungicide, against the pathogens that are transmitted by the seed *Tilletia sp.* (tilletia), *Fusarium sp.* (fusariosis) and *Ustilago tritici* (charcoal). Particular attention was paid to the sowing of the eight wheat genotypes Glosa, Litera, Izvor, FDL Miranda, Sorrial, Solveig, Apache, Avenue, in order to avoid mechanical impurification. On the germination capacity in the field an influence is given also by the pedoclimatic and meteorological conditions during the period between sowing and the sprouting of plants. Therefore, in order to create favorable seeding conditions and increase the germination capacity in the field, it is particularly important to know the optimum temperatures, humidity and aeration of the soil layer for sowing and, depending on them, to correlate the sowing season, depth and other specific agro-technical processes.

Weed control was carried out with the Sekator Progress systemic herbicide at a dose of 0.10 l/hectare, in the spring in post-emergence. Against pathogens, Topsin 70 WDG (1kg/hectare) systemic fungicide with preventative and curative effect was used to combat and treat *Erysiphe graminis* (wheat powdery mildew), *Puccinia spp.* (wheat rust), *Fusarium spp.* (fusariosis), *Helminthosporium sativum*(ripening of leaves).

Against pests, *Lema melanopa* (leaf beetle), *Eurygaster Integriceps* (wheat shield bug), *Haplothrips tritici* (wheat trips) was applied systemic insecticide Mospilan 20SG s.a. Acetamiprid 20% at a dose of 0.1 kg/hectare.

A very important work applied to the seed lots is the biological purification, which implies responsibility and consists in eliminating all the nonspecific plants of the variety from the seed crop, maintaining the typicality of the variety.

Wheat harvesting was carried out on varieties, with the harvester Claas Tucano 320, at 14% humidity and with great responsibility for avoiding mechanical impurification.

Experimental methodology in the laboratory

In the laboratory, each variety of wheat was investigated, following the productivity elements but also quality indications. Analyzes were conducted regarding:

- Thousand Grain Weight (TGW);
- production (kg),
- seed moisture expressed as a percentage (U%);
- germination on filter (BP), expressed as a percentage (G%).

Seed germination in Lindhard vessels, mixed (S) 1: 1 using soil from the four zones, expressed as a percentage (G%) which was determined using SR 1634/1999.

The results of the laboratory analyzes were processed and graphically represented.

Preliminary analyzes were performed in the laboratory, with soil from the four locations, the germination results being analyzed and graphically represented. After germination analyzes it was found that:

- Glosa variety recorded slightly fluctuating germination values, being between 97% in Gemenele and Tudor Vladimirescu and 96% in Rîmnicelu and Movila Miresii. Abnormal germs are in the range of 1-3%. The lowest value of abnormal germs was recorded on the soil in the locality of Tudor Vladimirescu. The percentage of dead germs is between 1-2%.
- Litera variety recorded the highest germination value on the soil from Movila Miresii of 97%. The indices values of abnormal and dead germ were between 1 and 3%.
- FDL Miranda variety recorded slightly fluctuating germination values, being between 96% in Gemenele and 95% in Rîmnicelu, Movila Miresii and Tudor Vladimirescu. A difference of 3% is observed in the abnormal germs in the locality of Tudor Vladimirescu compared to the locality of Gemenele.
- Izvor variety recorded slightly fluctuating germination values between 97-99%. The highest value is 99% in the localities Rîmnicelu and Movila Miresii. The percentage of abnormal germs is between 0-2%.
- Sorrial variety records the highest germination value of 98%, on the soil from Gemenele. The percentage of abnormal germs is slightly fluctuating between 0-2%. In Tudor Vladimirescu locality the percentage of dead germs is 7%, compared to the Gemenele and Rîmnicelu localities of only 1%.
- Solveig variety records germination values between 92% and 96%. The highest percentage of germination was recorded on the soils from Gemenele and Movila Miresii.
- Avenue variety recorded slightly fluctuating germination values, being between 97% in Rîmnicelu and 95% in Tudor Vladimirescu. The percentage of abnormal germs is between 2-4% and the percentage of dead germs is between 1-2%.
- Solveig variety records germination values between 92% and 96%. The highest percentage of germination is recorded on the soils from Gemenele and Movila Miresii. The percentage of dead germs is between 3-6%.
- Apache variety recorded the percentage of germination between 99% on the soils from Gemenele and Rîmnicelu localities and 95% on the soil from Movila Miresii locality. From the analyzes resulted small differences in the percentage of abnormal germs (0-1%.) The percentage of dead germs is between 1-4%, the lowest value is recorded on soils from Gemenele and Rîmnicelu of 1%.

Chapter 5 "*Modeling of the obtained experimental data*" presents the modeling of the data obtained in research using the Anova analysis, in which it was proposed to identify the existence of soil influences in the localities of Tudor Vladimirescu, Gemenele, Rîmnicelu and Movila Miresii on wheat varieties, regarding the number of ears/m², number of grains/ear, thousand grain weight (TGW), germination (G%), humidity (U%) and production, by comparing the averages of several samples. The working methodology includes the calculation of the horizontal and vertical averages, the comparison with the minimum and maximum values on the criterion of the seed performance of the variety and the

analysis of the intermediate and final rankings of the high-yielding varieties and of the soils with higher productive yields. The comparison matrix was made referring to the technical specifications of the varieties containing general seed characteristics based on the tests carried out by the research institutes.

Following the evaluation of the agricultural production and the quality indicators, there were identified the morphological and physiological characteristics of the Romanian and French seed material used in sowing, soil types and climatic factors. Analysis of the evolution of precipitation in Romania in recent years has shown that the summer season is becoming drier, and the extreme weather causes very large losses in agriculture. The French varieties do not show great stability and resistance to adapting the seeding material according to the pedoclimatic conditions, while the Romanian varieties have stability to the local pedoclimatic conditions, being less demanding in terms of the quality of the sowing soil (*objective 1 and 2 of the research*).

Statistical and graphical analyzes were performed based on the data collected, which revealed the existence of differences regarding: number of ears/m², number of grains/ear, thousand grain weight (TGW), germination (G%), humidity (U%) and production.

Summary of results

- influences of soils on the averages of ears/m² in the period 2016-2018

In 2016-2017, the number of ears/m² in the Romanian varieties is between 413 in the Litera variety in Movila Miresii and 477 in the Izvor variety in Gemenele.

In 2017-2018 the number of ears/m² is between 407 in the Litera variety from Movila Miresii locality and 491 in the Izvor variety from Gemenele.

According to the productive ranking, the Sorrial variety on the 1st place in terms of the indicator average ears/m², with an average productive value of 573,625 ears/m², respectively 119.68%, compared to the average of the varieties calculated at the value of 513 ears/m².

- influences of soils on the averages of grains/ear in the period 2016-2018

The number of grains per ear represents an essential component of productivity, which was highlighted in culture in the Romanian varieties Glosa and Litera from Movila Miresii (2016-2017 and 2017-2018) and from Rîmnicelu locality in 2016-2017. The average number of grains/ear in the Romanian wheat was between 32 in the Izvor variety and 36 in the Litera variety in Rîmnicelu and Movila Miresii. From the foreign varieties, it is noted the Apache and Avenue varieties with 34 grains/ear in Gemenele and Rîmnicelu localities.

According to the statistical analysis for the average grain/ear indicator, the Avenue variety is on the 1st place of the ranking, with an average productive value of 31.5 grains/ear, respectively 97.56%, compared to the average of the varieties calculated at the value of 32 grains/ear.

- influences of soils on the average productions during the period 2016-2018

The production per hectare in the Romanian varieties in 2016-2017 was between 5724-6683 kg/ha. The largest production was recorded by the local variety Glosa with 6683 kg/ha from Tudor Vladimirescu locality. From the foreign varieties, the Sorrial variety stands out with 7792 kg/ha from Gemenele locality.

In the year 2017-2018 the local production was between 5266 kg/ha in the FDL Miranda variety from Movila Miresii locality and 7095 kg/ha in the Izvor variety from Gemenele locality. From the foreign varieties it is noted the Sorrial variety from Gemenele locality.

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According to the production ranking for the production indicator kg/ha, the Sorrial variety is on 1st place of the ranking with an average productive value of 7425.25 kg/ha, respectively 111.79%, compared to the average of the varieties calculated at the value of 6917 kg/ha.

From the productive point of view, even if the resistance of the foreign varieties in terms of adapting the pedoclimatic conditions is high, they succeed due to the genetic characteristics presented in the data sheets to give production yields higher than Romanian varieties with land adaptability. The most productive variety, from a productive point of view, according to the study performed is the French variety Sorrial (*objective 3*).

- influences of soils on the thousand grain weight during 2016-2018

In the period 2016-2017, the varieties that stood out with the TGW over 45 grams are Glosa from Tudor Vladimirescu and the variety Apache from Tudor Vladimirescu in the year 2016-2017, and in 2017-2018 it stands out the indigenous variety Glosa with the TGW of 45.5 grams and the Apache variety with TGW of 46.6 grams from Tudor Vladimirescu locality.

For the TGW indicator (grams), the Apache variety is on the 1st place of the ranking with an average productive value of 44,825 grams /1000 grains, respectively 103.41%, compared to the average of the varieties calculated at the value of the TGW of 45 grams.

- influences of soils on the humidity averages in the period 2016-2018

The harvesting must be completed when the grains have reached about 12 -13% humidity, later the wheat enters the over-ripening phase and the shaking losses are amplified. The lowest humidity at harvest was recorded by the Izvor variety with 12.2% from Gemenele locality and the variety of Avenue with 12% from Tudor Vladimirescu locality.

Between 2017-2018, the Izvor variety recorded the lowest humidity in Tudor Vladimirescu, and the highest value of 13.2%, was reached by the Sorrial and Avenue variety from the same location. From the ranking point of view the Apache variety is on the 1st position of the qualitative characteristics for the seeding wheat moisture indicator, with an average value of 12.7%, respectively 98.78%, compared to the average of the varieties calculated at the value of 12.7%.

The French variety Apache and Avenue, considering the classification of the qualitative characteristics for the seeding wheat moisture indicator, are on the 1st and 2nd place of the ranking, with an average value of 12.7%, respectively 98.78%, compared to the average of the varieties calculated at the value of 12.7%.

- influences of soils on germination averages in the period 2016-2018

Between 2016-2017, the local variety Glosa showed a very good germination of 99% in the localities of Gemenele and Movila Miresii, and among the foreign varieties the Solveig variety is also noted with a germination of 99% in the locality of Rîmnicelu.

In 2017-2018, all the local varieties recorded germinations of 98%, the Glosa variety in Tudor Vladimirescu and Rîmnicelu localities, the Litera variety in the Movila Miresii locality, the Izvor variety and the FDL Miranda variety in the Rîmnicelu locality. Of the foreign varieties, the Apache variety stands out with a germination of 97% in the locality of Tudor Vladimirescu.

From the point of view of the qualitative ranking for the germination capacity indicator (%) of the seeding wheat, the Glosa wheat variety is on the 1st place of the ranking with an average germination capacity of 98%, respectively 102.29%, compared to the average of the varieties calculated at 96%.

From a qualitative point of view, the French varieties do not manage to acclimatize on the soils of the 3rd quality and present quality indicators with much lower indices than the Romanian varieties (*objective 4*).

Constanța Băcanu (Șerban)

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From a productive point of view, even if the resistance of the foreign varieties regarding the adaptation to the pedoclimatic conditions is not high, they succeed due to the genetic characteristics included in the technical data sheets to give higher yields than the Romanian varieties with adaptability to the field. The most efficient variety from a productive point of view, according to the study carried out, is the French variety Sorrial.

Based on the analyzes performed, the randomized ranking of the productive performances of the eight Romanian varieties (Glosa, Litera, Izvor, FDL Miranda) and French varieties (Apache, Avenue, Sorrial Solveig) was also performed according to the pedoclimatic conditions.

In conclusion, the best variety in terms of production kg/ha is Sorrial, the French variety whose maintainer is Caussade Semences, and the most adapted to the local soil is the Glosa variety whose maintainer is INCDA Fundulea. There are significant seasonal differences of about 500 kg/ha on average from one year to another, the French varieties better fruiting on a field corresponding to the second class and without seasonal variations, and in the weak agricultural years can generate yields below the productive capacity of the Romanian varieties. Following the analysis it is recommended to use the French variety Sorrial, which is the most productive variety and in the long term increases the profit of the farmer.

The bibliography used in the paper is made up of the list of works taken from the agricultural, international and national literature, studied in order to carry out the documentary study useful for the elaboration of the doctoral thesis.

During the doctoral studies 48 papers were published / presented, of which: 2 books / chapters published in recognized publishers, 1 articles published in ISI indexed journals, 23 articles published in ISI Proceedings volumes, 4 BDI indexed journals, 18 papers presented at international / national conferences with participation.

The results of the research were disseminated, by presenting 3 papers at national and international conferences.

Awards obtained during the period 2016-2019:

Certificate of Attendance - Second Prize Award, 2019, SCDS-UDJG, Galați, 13-14 June 2019;

Third Prize Award - 2019, SCDS-UDJG, Galați, 13-14 June 2019;

Certificate of appreciation, Review - International Committee Board of the 32nd International Business Information Management Association Conference;

Certificate of appreciation - 32nd IBIMA International Conference, 14-15 November 2018;

Certificate of appreciation - 31th IBIMA International Conference, 25-26 April 2018;

Certificate of Attendance - SCDS-UDJG, Galați, 7-8 June 2018;

Certificate of appreciation – Review - International Committee Board of the 31th IBIMA International Conference, 2017;

Certificate of Attendance - SCDS-UDJG, Galați, 8-9 June, 2017;

Certificate of appreciation - Review - International Committee Board of the 30th IBIMA International Conference, Sustainable Economic development, Innovation Management, 2017;

Certificate of appreciation - 30th IBIMA International Conference, 8-9 November 2017.

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