

## **ABSTRACT**

### **"RESEARCH REGARDING THE MANAGEMENT OF FERTILIZATION AND FUNGICIDES TREATMENT ON PREMIUM WHEAT VARIETIES"**

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The title of this scientific paper "Research regarding the management of fertilization and fungicides treatments on Premium wheat varieties" represents an elaborate study of the importance of introducing wheat varieties with higher baking parameters, into the farms.

*Triticum aestivum L.*, known as soft or hard wheat, is the third most cultivated crop in the world, along with corn and rice, which has a major importance in human alimentation, animal feed and industries, as example the production of biofuel.

The three main milling groups of wheat according to protein content are: feed wheat (less than 12.5%), baking wheat (12.5-14.5%) and hard wheat or Premium wheat (>14.5 %). The last one being considered as ameliorative grains for flour used in bakery. Due to the fact that there is not enough Premium wheat produced annually, chemical synthesis by-products are used.

Given the importance of wheat, the agricultural input industry and research institutes, allocate annually a large amount of money for the development of plant protection products, fertilization product, modern agro-technical technologies and last but not least, for the improvement of new varieties and hybrids, more adapted to the biotic stress factors, specific for this crop.

Due to the need to obtain the highest yields, in the super intensive agriculture era, the excess intake of chemical fertilizers and plant protection products, led to pollution and degradation of the environment. Thus, as pathogenic pressure increases based on adaptability and environmental restrictions, force the elimination of invasive pesticides and the reduction of chemical fertilizers, it is necessary to develop new technologies for the management of wheat crops.

The main measures that are required in new practices of modern agriculture are performant crop rotation, the use of less invasive technologies for the soil, the use of precision equipment for observations of plants health and the introduction of new wheat varieties into farms.

The characteristics to be followed in selecting a wheat variety are to adapt to different type of soil and climatic conditions, increased tolerance to specific pathogenic pressure and efficient use of nitrogen in order to maximize yields.

Five Premium wheat varieties (Adesso, Arnold, Gallio, Laurencio and Midas) were selected, of which three were introduced for the first year on market and one of class A (Balaton), which covers a major national areas. These were tested on two areas of major interest for agriculture in Romania (Burnaz Plain and Someș Plain), during 2013-2016, in research platforms, where several variants of fertilization and fungicide treatments were introduced.

The main objectives of the study were:

- Monitoring the behavior of wheat varieties in the pedoclimatic specific conditions, for the two research areas, on the dynamics of the yield components;
- Use of modern equipment to determine chlorophyll and plant nitrogen content in order to optimize the intake of fertilizers;
- Determination of the influence of nitrogen fractions and different fungicides treatments on the yield and quality parameters of studied wheat varieties;
- Monitoring the spectrum of encountered diseases in the research years according to their intensity, frequency and degree of attack, to establish the genetic resistance of the six wheat varieties.

The final aim of the present research paper was to validate the degree of adaptation of the new Premium wheat varieties, to the proposed technological variants and the confirmation of their zoning.

The doctoral thesis is divided into two parts; the first part of the bibliografic study and the second part, the personal researches, being structured on seven distinct chapters.

Chapter I, entitled "The current state of knowledge of Premium wheat", presents a brief history of wheat crops, the classification of wheat according to its main characteristics, the international statistical results and the importance of wheat crops in general.

Chapter II entitled "Current state of knowledge concerning Premium Wheat crop technology" includes the general description of Premium wheat basic technology, nitrogen fertilizer fertilization management and the presentation of the spectrum of diseases specific for wheat.

Chapter III describes the "Natural area where researches were located", thus presenting the locations where the two experimental fields. There were S.C.D.A. Teleorman, located in the Buraz Plain (center of the Romanian Plain) and S.C.D.A. Livada, located in Someș Plain (northern area of the West Plain). Thus, it was presented the importance of choosing the two locations and their pedoclimatic characteristics, with emphasis on the multiannual average temperatures and rainfall recorded during the three years of research.

In Chapter IV, "Research Materials and Methodology" are presented, thus highlighting the purpose and objectives of the development of the two test platforms and the way in which field and specialized laboratories determinations were carried out, statistical modeling and interpretation of the results.

It is very important to mention here that the research structure was originally targeted only at the experimental field in the southern region of the country (2013-2016), and after the first year it expanded to the northern area (2014-2016), for obtaining results with greater overall coverage.

The experience platform in the south consists of a series of five Premium wheat varieties and one class A, a fertilization scheme with three doses of fertilizer (N1-N3) and three variants of fungicide treatment (T1-T3), in a series of three repetitions.

The research platform in the northern area of the country, maintained the six wheat varieties already analyzed, to which the Boema wheat variety was added, on four variants of fungicide treatment (T0-T3), in three repetitions. The fertilized management used on this platform, was similar to N3 in the southern area.

The results obtained in the two experimental fields were confirmed in the quality laboratory of Probstdorfer Saatzucht Romania SRL and in the Phytopatology Laboratory from the Agriculture Faculty of U.A.S.V.M. Bucharest. Interpretation of statistical results and graphics rendering was performed with the help of Anova, Microsoft Excel, Table Curve 2D and Table 3D curves.

Chapter V, called "Production results obtained in the experimental fields, laboratory processing and statistical data interpretation" highlighted the results obtained on each initially proposed target.

Results were presented on plant development in the two experimental fields, from sowing to forming production components. Premium wheat varieties have been sustained by good wintering resistance, high tillering capacity and very dens foliar surface due to the plant height.

Determinations of chlorophyll and nitrogen content of the leaves have been performed only for the southern area and have highlighted the increased need for fertilization of Premium wheat varieties such as Arnold, Adesso and Lorenzo. The Gallio variety was highlighted by the good response to the fertilizer intake, given the increase in yield, but less of the quality.

The production and quality results showed the different behavior of each variety in the two areas. In S.C.D.A. Teleorman, there were highlighted Gallio and Adesso varieties, and at S.C.D.A. Livada, Lorenzo and Adesso varieties. From the point of obtained quality, Arnold, Adesso and Lorenzo had the best results on both locations.

Chapter VI, entitled "Results on the clinical state of wheat on the two experimental fields" was dedicated to the observation of the diseases presents on the studied wheat varieties and the confirmation of pathogens in the phytopathology laboratory.

The detected diseases were *Erysiphe graminis f. sp. tritici*, *Leptosphaeria nodorum*, *Mycosphaella graminicola*, *Puccinia recondita*, *Puccinia striiformis* and *Gibberella zeae*.

The observation of the attack degree of the identified micromycetes showed a generalized presence for all varieties and fungicides treatment variants for *Mycosphaella graminicola* and *Gibberella zeae* and their response to application of the fungicide treatments.

Also, Adesso and Laurenzio varieties were highlighted by their highly resistance to the attack of *Erysiphe graminis f. sp. tritici*, Midas and Adesso varieties in the *Puccinia recondita* attack and Balaton, Arnold, Gallio and Laurenzio varieties in the attack on *Puccinia striiformis*.

From Chapter VII, "General conclusions and recommendations", the following can be extracted:

- All the monitored varieties responded positively to the pedoclimatic conditions in the two studied areas;
- The highest yield increases were given by application of fertilizer (N2) at the stem elongation stage, but in terms of quality, the increase was given at the booting stage (N3); fractional fertilizers based on nitrogen are recommended;
- The new varieties, Gallio and Adesso, had the best behavior for the southern area, and the varieties Adesso and Laurenzio for the northern area, confirming the importance of zoning cultivated wheat varieties;
- Gallio variety, although originally included in the Premium class, failed to exceed the values of bakery class A, under the conditions of applied technology, but it was evidenced by the increased capacity for absorption and use of nitrogen fertilization;
- From the point of view of fungicide treatments, highest yields were due to the application of at least one treatment (T1) and the highest quality obtained was given by the ears treatment (T3); it is recommended to apply at least one fungicide in the vegetation phase and a fungicide at the ears;
- All Premium and Class A tested varieties are an alternative to wheat crops in Romanian farms.

The novelty of the researches undertaken in the PhD thesis is given by the interdisciplinary study on the new Premium wheat varieties, Adesso and Laurenzio introduced for the first time on the Romanian market, as well as the Gallio variety introduced in Romania as Premium wheat variety and later declassified in class A.

The doctoral thesis is based on a number of 211 pages, 86 figures and 25 tables, of which 57 figures and 10 original tables.

The results obtained during the three years of research were validated through publications in specialized journals indexed in international databases, rated B+ and ISI.

The bibliography of the paper is made up of a number of 158 specialized titles, provided by national and international literature, composed from books, articles, magazines and accredited web pages.

All the data obtained from the present research are in line with the international experimental technique and bring a novelty regarding the new Premium wheat varieties studied and the crop management systems, precisely on fertilization and fungicide treatments.

The results of this study provide the guarantee for the use of the new studied wheat varieties, on pedoclimatic conditions and the pathogenic pressure specific to the two analyzed crop areas, but urges the use of agricultural inputs only after a good observation of the crops.