

# ABSTRACT

## **Keywords:**

*Triticum aestivum* L., *Blumeria graminis*, *Septoria tritici*, *Puccinia* spp., natural infection

Wheat (*Triticum aestivum* L.) is one of the oldest cultivated crops and is estimated to have been introduced into culture approximately 10,000 years ago, having its center of origin in the Karacadag Mountains (nowday's southeastern area of Turkey).

Due to the total cultivated area, being the most cultivated grain, but also because of it's importance as a food product and many other applications and attributes it enjoys, wheat is considered the "queen of grain", being irreplaceable in human existence and activity.

The economic importance and the key role it plays in human nutrition are the basis of the present and future trend of wheat, highlighted by the ascendant tendency of world production. In addition to this trend in the production capacity, other objectives are emerging, such as the development of new wheat varieties with good qualitative qualities, with high nutritional value but also endowed with good baking qualities.

The attention given to the development of wheat varieties with various attributes is confirmed by the global research of wheat with qualitative qualities and by the production capacity of this crop. However, it has been observed that in the last decades the progress achieved in obtaining varieties endowed with high production capacity and superior qualitative qualities is noticeable when compared to wheat varieties that are resistant to pathogens, which can cause significant quantitative losses and may influence in a negative way the qualities of wheat kernels.

The intensive farming practices applied in the last half-century to meet the economic and food needs of the world population, in wheat crop are visible by the cultivation of varieties with high yields, high density and excessive fertilization, and in some region under irrigation regimes, are the factors that create optimum conditions for wheat pathogens growth. The emergence and sustained growth of pathogens causing wheat diseases requires the discovery of preventive and control measures to limit or avoid the damage they cause.

Breeding and development of resistant wheat cultivars to fungal pathogens is the most effective method for preventing and combating diseases in this crop, and, therefore behavioural studies of new wheat

varieties, especially Romanian wheat cultivars, should present increased interest from agricultural specialists and researchers. Farmers need to have access to studies on wheat genotypes commercialised on the Romanian market so they can make better choices when they plan to establish the range of varieties or hybrids they want to cultivate. Selecting the most appropriate cultivar does not guarantee superior yields, but choosing a cultivar that is not adapted to the environmental conditions of a growing area could make these investments unprofitable.

In view of the above mentioned, this research is considered to be of interest and the results obtained and included in the PhD thesis, entitled "Research on the resistance of some wheat varieties at the attack of diseases in the north-east region of Moldova" can contribute to enriching the current data and knowledge available for agricultural, with positive implications in constant development of the range of wheat varieties, corroborated with high yields and good resistance to pathogens.

The PhD thesis is structured in 2 parts and comprises 7 chapters, covering a total of 198 pages. Within this thesis are present 30 tables and 51 figures. For the elaboration of this thesis, 242 bibliographic resources were analysed, and some of the results obtained from the research were already published in different scientific journals.

**Chapter 1 Historical background** includes data on the situation and importance of wheat crop worldwide, with an emphasis on the place it has on cultivated plants, as well as the evolution of wheat covered areas over the past 50 years and the distribution of these areas on continents. Last but not least, the current yields of wheat crop is presented, making a comparison with the most important cereals. The second part of this chapter presents the importance of wheat crop in Romania, with data on the contribution of Romanian wheat yields to European Union and world wheat production. Historical data reflecting the evolution of the areas cultivated with wheat, the average yield per hectare and the total yields obtained in Romania, as well as other important events for wheat in Romania, such as the availability of foreign wheat germplasm, sometimes superior to the Romanian one, which has made it possible to grow and achieve higher yields.

**Chapter 2 Current knowledge** state of wheat pathogens and the diseases caused by them contains the description of wheat pathogens identified during the research period. For each pathogen we present data on yield losses, disease cycle and epidemiology, and on disease control methods.

**Chapter 3 Aim and objectives of research, research materials and methods** presents the major goal of the the thesis, represented by the

evaluation of wheat varieties and lines under pathogen stress. In order to accomplish the PhD thesis, a number of objectives were set and accomplished through the activities carried out within the framework of this research. In this chapter are included data on experimental field design, on the biological resources used in the present research. Among the 35 cultivars of wheat included in the study, Bezostaia 1 wheat variety (the witness of the experience) was described in detail and presented the importance and impact that a single wheat variety may have in world wheat production. Moreover, are presented the cultivation technology applied to wheat crops, as well as the observations made on wheat crops both in the field and in the laboratory, and the protocols used for each observation.

**Chapter 4 Analysis of climate data of the study period and evaluation of the natural frame in which the research has been conducted** presents environmental data generated by the meteorological station located at the Ezereni farm. Climate data, air temperature, soil temperature, atmospheric precipitation and distribution have been analysed to provide a clear picture of the climatic factors influence on wheat production and pathogen incidence.

**Chapter 5 Results and discussions on the elements of production of winter wheat** presents data obtained during three years research on plant density, plant height and ear height, number of kernels per ear and their weight, thousand kernel weight (TGW) and hectolitic mass (HM), and yields. Results for each observation were analysed statistically, by comparison with values recorded for the control variant, namely Bezostaia 1.

**Chapter 6 Results and discussion concerning the behavior of the winter wheat cultivars at the attack of the pathogen agents** contains data on pathogens *Blumeria graminis* (DC) E.O. Speer f.sp. tritici Em. Marchal, *Zymoseptoria tritici* (Desm.) Quaed. & Crous, anamorph *Septoria tritici* Berk. & M.A. Curtis, *Puccinia triticina* Eriks. f.sp. tritici Eriks. and Henn., *Puccinia striiformis* Westend. f.sp. tritici Eriks., *Puccinia graminis* Pers.:Pers. f.sp. tritici Eriks. and E. Henn., identified in this research. For each pathogen, the frequency and severity of the attack were determined, and based on this values the overall attack degree of each pathogen was calculated. Attack degree values were the basis for statistical analysis, by comparing of values recorded for each cultivar with attack degree values recorded for the control cultivar, Bezostaia 1.

**Chapter 7 Results and discussion concerning Black point** presents data describing the symptoms caused by Black point infections, as well as the incidence degree during the two years study period. Increased values for Black point infections observed during this period required a more elaborate

observation of this disease, reason for which the influence of Black point inference on a thousand grains was also calculated and results included in this chapter. Another aspect followed and achieved in this study was the evaluation of microorganisms responsible for this disease.

The last part of this thesis presents **conclusions and future recommendations**, where the most important and relevant information of this thesis is highlighted.

For each wheat cultivar studied were presented information on yields obtained during the studied period, the TGW and HM values recorded in each agricultural year studied, as well as the characterisation of the resistance against the pathogens frequently encountered in the north-eastern part of Moldova.

As a result of the research, each wheat cultivar studied can be characterised in terms of production and productivity, as well as resistance to pathogens.

Following the information presented in the thesis, a realistic image can be portrayed on the behavior of wheat cultivars in climatic conditions specific of the Moldovian region and under pathogen attack.