

## ABSTRACT

**Keywords:** *Helianthus annuus*, *Plasmopara helianthi*, *Phomopsis/ Diaporthe helianthi*, *Septoria helianthi*, *Puccinia helianthi*, *Sclerotinia sclerotiorum*, *Orobanche cumana*.

The Sunflower (*Helianthus annuus*), is an oleaginous plant of great economic and food importance.

High content of quality edible oil, industrial uses are the main reasons for increasing interest in sunflower crop, and implicitly the increase of cultivated areas.

The economic importance, but also the very important role in human nutrition and industry, are the basis of the current and future trend to increase the cultivated area, but especially to obtain hybrids with very good quality qualities and with nutritional value and high oil content, to get a large production on the surface. The attention paid to obtaining sunflower hybrids is highlighted by the research conducted worldwide on quality qualities but especially on the production capacity of sunflower crop. In recent decades, progress has been made in obtaining hybrids with a high production capacity but also with higher quality qualities such as good resistance to pathogens, which can lead to significant production losses and can negatively influence the qualitative qualities of sunflower seeds.

Intensive farming practices applied over the past half century, to meet population needs and food requirements, have led to the cultivation of high production capacity, high densities and excessive fertilization of sunflower hybrids, in addition to irrigation in some places, it is the measures that create the optimal conditions for different pathogens. The emergence and development of pathogens, which cause diseases in sunflower, requires the development of prevention and control measures to limit or avoid the damage that may be caused by them.

Breeders create sunflower hybrids with resistance to both pathogens and the parasite *Orobanche cumana* Wallr, which is the most effective method for preventing and combating diseases and broomrape.

The study of the behavior of different hybrids of both native and hybrid ones coming from other countries is constantly paying special attention from specialists and researchers in agriculture. For testing the genetic material under conditions of natural or artificial infestation, a range of differentiators may be commercial hybrids, characterized by the manufacturing companies in the literature or confirmed lines with known reaction.

Zoning of commercial sunflower hybrids both in terms of acclimatization and in terms of tolerance and resistance to diseases and the parasite broomrape, are the informations to which farmers must have access, so as to make the most advantageous choices. Choosing the best hybrids to suit the environmental conditions in the area can make the investment profitable.

The results of the research that is the subject of the doctoral thesis can contribute to the enrichment of knowledge regarding the diversification of the range of sunflower hybrids with high production potential, zoning of hybrids so as to make good use of the prodo-climatic conditions, and to highlight their genetic potential, resistance and tolerance to pathogens and stress factors.

The researches carried out for the elaboration of the doctoral thesis entitled “*Researches on the dynamics of the main pathogens in the sunflower in the South-Eastern conditions of Romania*” were conducted in the test fields with natural infestation with various pathogens with the parasite *Orobanche cumana* Wallr. For the study of the resistance of the sun flower to the attack of pathogens and the parasite broomrape, commercial hybrids of sunflower from various manufacturing companies were tested.

The paper is structured in 2 parts, comprises six chapters, covering a number of 199 of pages.

In the thesis, a number of 51 tables and a number of 35 figures. For the thesis, a number of bibliographic sources, and some of 173 the results obtained from the research were published in specialized journals.

Chapter 1 The historical context includes data on the importance of sunflower culture worldwide. The sunflower is a crop of great economic importance, it is cultivated mainly for oil production, but also for the production of grain for animal feed. In this chapter, the situation of the sunflower crop worldwide, the cultivated areas and the production obtained, as well as the importance of the sunflower culture in Romania is presented.

Since 2015, Romania has been the first place in the European Union, in the production of sunflower, but also in the cultivated area. In 2020, it ranked first in the European Union, with a total production of 2.07 million tons, according to data from INS. Historical data reflecting the evolution of the sunflower surfaces, the yields obtained per hectare, but also the total production worldwide and in Romania, as well as elements such as the introduction of sunflower germoplasm from abroad and from the country, are presented. which makes it possible to increase productivity and quality of production and to achieve increasing yields in this culture.

Chapter 2. The current state of knowledge of the pathogens of the sun flower and the diseases caused by them includes the description of the pathogens of the sun flower identified in the period studied.

The main pathogens identified in the sunflower culture in the years studied are: *Plasmophara halstedii* (the mana of the sunflower), *Phomopsis/ Diaphorte henianthi* (the brown stain and the breaking of stems), *Septoria helianthi* (septoriosiis), *Puccinia heliathi* (the black rust of the sunflower). *Sclerotinia sclerotiorum* (white rot), *Orobanche cumana* Wallr (broomrape). For each pathogen, data on the area and economic importance, description of the pathogen, disease cycle and epidemiology, and methods for their prevention and control are presented.

Chapter 3 Aim and objectives of research, research materials and methods present the purpose of the paper, represented by the evaluation of the behavior of some hybrids of sunflower, cultivated in Dobrogea, at the attack of pathogens and the parasite *Orobanche cumana* Wallr. A comparative study of commercial sunflower hybrids is needed, used as genetic differentiators, cultivated under conditions of natural lupus broomrape infestation, in terms of attack resistance and productive potential of seeds and oil. Last but not least, there is a need to study the effectiveness of treatments applied in vegetation to sunflower.

Depicted is the cultivation technology applied to the sunflower crop, as well as the observations made in the experimental fields, as well as the working methods for each observation performed.

A number of objectives have been pursued in order to achieve the proposed goal through specific activities:

- conducting a bibliographic study on the implications of pathogens and aroomrape parasite in sunflower culture
- identification of pathogens and determination of the frequency (F%) and intensity (I%) of their attack in order to establish the degree of attack (GA%).
- knowledge of the behavior of sunflower hybrids and observations on the reaction of hybrids to the attack of identified pathogens.
- the influence of trataments with plant protect products in the fight against sunflower diseases.

The experimental fields and the natural environment of Traian-Peceneaga, Tulcea County and Cogealac, Constanța County are described. The settlement of the experiences was carried out according to the method of randomized blocks, with 3 repetitions and 9 variants in the experimental field from Traian-Peceneaga, and 3 repetitions and 18 variants in the experimental field from Cogealac.

This chapter also shows the biological material used in the experimental fields.

Chapter 4. Characterization of the natural framework in which the researches and analysis of the climatic data characteristic of the studied period, includes data related to the natural framework in which the researches were carried out, Traian-Peceneaga area in Tulcea county and Cogealac area in Constanța county. The pedo-climatic data represented by the soil texture and structure, air temperature, atmospheric precipitation and their distribution were studied and analyzed to obtain a clear picture of the influence of the pedo-climatic conditions on the production elements (oil content, calatide diameter, MMB, MH, amount of achenes per hectare), pathogens of the sun flower and the parasite broomrape.

Chapter 5. Results on the evolution of the main pathogens and the broomrape parasite in the sunflower culture in South-Eastern Romania, include the materials and working methods that aimed in particular to determine the pathogens that cause diseases in the sunflower.

It was determined the frequency, intensity and degree of attack of pathogens and the parasite broomrape, but also the evolution of their virulence.

The importance of the sun flower in Dobrogea is the main reason for the study of the pathotogene agents and the parasite *Orobancha cumana* Wallr, and to provide the growers in this area with information on a wide range of hybrids and information on their reaction to the treatments with plant protection products.

The studied sunflower hybrids have registered an attack of, *Plasmopara halstedii*, *Septoria helianthi*, *Puccinia helianthi*, *Phomopsis/ Diaporthe helianthi*, and *Sclerothynia sclerotiorum*.

In this chapter are given the pathotypes of the pathogen *Plasmopara halstedii* identified in the sunflower crops in Romania and the spectrum of physiological breeds of the broomrape population in Dobrogea.

The study of a set of sunflower lines has highlighted the fact that in recent years, in the framework of breeding programs, material resistant to new breeds developed by some pathogens, but also by the parasite broomrape is created.

Chapter 6. Results obtained in hybrids of sunflower experienced in the conditions of the attack of the main pathogens and the parasite broomrape, in the south-eastern area of Romania, in this chapter, the hybrids studied for disease and broomrape attacks were analyzed from the point of view of important characteristics and were experienced for the effect of chemical treatments, to combat the attack of important pathogens.

Determinations were made regarding the elements of production of the sun flower such as: Oil content, calatide diameter, mass of one thousand grains (MMB), hectoliter mass (MH), and the amount of seed obtained per hectare, under cultivation conditions in the experimental fields of Dobrogea in the years 2018-2021.

This chapter contains data on the effect of chemical treatments, approved for the control of various pathogens, on sunflower in the experimental field of Traian-Peceneaga, where treatments with plant protection products have been applied with fungicides Tanos 50WG and Pictor 400 SC.

Pictor 400 SC is one of the best known products for the protection of rape and sunflower crops and Tanos 50WG is complex fungicide with wide spectrum, preventive, contact and local systemic.

The study looked at both the influence of the two fungicides on frequency (F%), intensity (I%), attack degree (GA%), and the effectiveness of the treatments. Observations were also made on how it influenced the production of sunflower seeds, the attack of pathogens, the untreated variants and the variants where foliar treatment was applied.

Studies have been carried out on the control of the parasite broomrape by genetic resistance. All these results and discussions bring a modest contribution to the knowledge of the reaction of sunflower hybrids to the attack of pathogens and the parasite broomrape and their zoning in conditions similar to those analyzed in Dobrogea.

We also want to inform farmers about how to attack micromycets, and the measures that can be taken to prevent and combat them.

The identification of wolf breeds must be a continuous process of research, as this obliged parasite, *Orobanche spp.*, will develop new breeds more aggressive and more virulent, causing damage to the host plant.

The last part of this thesis presents conclusions and recommendations, where the most important information contained in the thesis is highlighted.

The results of the research have practical application, as they help farmers in Dobrogea to zonate sunflower hybrids according to the genetic resistance of hybrids to pathogens and the existence of broomrape breeds in the territory.