SUMMARY
thesis:

RESEARCH ON CORN TOLERANCE TO DROUGHT AND HEAT IN THE CONTEXT OF CHANGING PLANT-SOIL-WATER-AIR RELATIONSHIPS CAUSED BY CLIMATE CHANGE

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Key words: *corn, germoplasm, climate change, resistance / tolerance, drought, heat, corn breeding, field conditions, HWS, LWS, laboratory controlled conditions, production, experimental network, water stress, PEG, production stability index, drought sensitivity index.*

Recent climatic changes have significantly increased the interest of breeders to improve germplasm in all crop plants, including maize, on their tolerance to drought and heat. Drought and heat are two distinct phenomena but have a devastating synergistic effect on crop plants, causing major damage to all agricultural species. The genetic conditioning of tolerance to these two phenomena is different and difficult in the absence of exact quantification methods. The identification and use of more accurate quantification of drought and heat tolerance in the selection process has become one of the primary objectives of the greatest importance in maize breeding programs from our country and worldwide. Epstein et al., (1980) found that physiologically, the ability of plants to adapt to different types of abiotic stress (drought, salinity, radiation, high or low temperatures, floods, etc.) and biotic (pathogens, competition with other organisms) that alter the plant-environment balance, can

reduce the biosynthetic capacity of the plant and cause injuries that can destroy the plant.

Maize (Zea mays L.) is a major crop in the world. Corn production and stability are significantly affected by water scarcity and excessively high temperatures in critical development phases. As a result, improved tolerance to drought and heat has become a priority in public and private sector improvement programs, and the identification of corn germplasm with high traits of drought and heat resistance has become an important target for breeders.

Creating and enhancing hybrids for drought and heat is a long-term strategy for maintaining and increasing production in future climatic events. The identification and characterization of germplasm with superior traits of drought and heat is an important step in corn breeding.

The study in this thesis evaluated a set of maize genotypes (simple hybrids) in field and laboratory conditions with different hydric stresses in different localities using a well-defined drought index to identify higher resistance / tolerance traits to drought and heat with direct impact on final production.

The methodology and maize germplasm used in this study are means of identifying the stability, variability and performance level of maize production in the context of changing current climate conditions.

The PhD thesis is structured in 5 chapters, to which is added the abstract, the introduction, and the bibliography.

Chapter I: Drought and it's consequences at global level: The information contained in this chapter presents the current state of the research on global drought and heat phenomena (a brief definition, identification, characterization and monitoring of drought / heat and a forecast of the evolution of ecoclimatic conditions both at our country level and globally).

Chapter II: State of research regarding corn breeding to heat and drought: In this chapter you can find detailed information about the corn culture and the influences of drought and heat on plants from a physiological point of view. It also analyzes the adaptability of maize under hydric and

thermal stress conditions, plant-soil-water-atmosphere relationships, and specific aspects for the improvement of maize germplasm for drought and heat tolerance.

Chapter III: Research matherial and methods and description of natural research conditions (research network)

The biological material used consisted of the most advanced perspective corn hybrids created at NARDI (National Agriculture Research and Development Institute) Fundulea, belonging to FAO groups 300-400, 400-500 and more than 500. Hybrids were experimented during the period 2012-2016 in competitive comparative microcultures (third year of testing and more) and in 2016 in comparative orientation cultures (second year of testing); the multiannual results used were obtained in the NARDI-Fundulea research network in suborder of Corn Breeding Laboratory from NARDI Fundulea.

Each year / location was classified into two water stress classes as follows: LWS (low water stress, normal production under normal climatic conditions) and HWS (high water stress, lower productions under drought conditions (below 6-7 t / ha). This classification was based on the climatic characterization (according to the climatograms presented in the thesis), but especially on the basis of the general production level obtained in the year and the respective location.

Field experimentation method: The comparative microcultures were seeded according to the fully randomized block method, using a density of about 80000 plants / ha in all test sites, regardless of the degree of water stress. Each microculture was seeded in 2 to 3 repetitions, in 4-row plots, 4.8 m long, and 0.7 m row spacing (from which the central rows were harvested to reduce intergenotipic competition).

Laboratory experimentation method: Physiological methods of inducing stress on corn plants with PEG solution (polyethylene glycol) were performed by physiological methods and the heat was simulated under controlled laboratory conditions in the growth chamber.

Chapter IV: Results and Discussion: This chapter covers all the results obtained in the field (research network) and laboratory in different environmental conditions, where the characterization and selection of maize hybrids for the stability of production and properties associated with heat and drought resistance / tolerance can be made.

Chapter V: Conclusions and recommendations: this chapter sums up:

- conclusions and recommendations on the characterization and selection of maize hybrids for the stability of production based on drought tolerance through the use of production data or other attributes associated with drought tolerance obtained in a wide research network characterised by diverse environmental conditions.

- conclusions and recommendations on the estimation of the capacity of certain physiological indices, determined by simple laboratory methods on maize seedlings, in the assessment of drought and heat tolerance and on their correlation with the results obtained in the field; the characterization and selection of maize hybrids by the use of rapid physiological methods for the appreciation of corn drought and heat tolerance in early development phases.

- recommendations on the strategy to improve the corn breeding scheme for enhancing the stability of maize hybrids to water stress and to create genotypes with high adaptability to various environmental conditions.