STUDIES ABOUT CLIMATE CHANGE IN THE BRĂILA PLAIN AND ADAPTATION METHODS FOR INCREASING THE ZONAL AGRICULTURAL BIODIVERSITY

SCDA BRĂILA
CERCETARE PENTRU BUNĂSTARE

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INTRODUCTION

The paper presents the trend of climate change in the Braila Plain over the last 10 years and their effect on agroecosystems, with a presentation on how to adapt to increasing agricultural biodiversity. The periods in which the agricultural crops were affected and the causes that led to the decrease of the productions are presented, as well as the invasive weed species from the Braila Plain and the way in which they act within the agroecosystems.

Because living organisms interact in agroecosystems, the extinction of a species can have a significant impact on agricultural production, and the mass extinction of some species could be very disastrous for human life.

Climate is one of the most principal factors that determine the productivity of agricultural crops, so that an adequate correlation between plant genetics, agricultural practices and local environmental factors is the quantitative and qualitative basis of production, climate being the most useful and cheapest resource, and zoning agro-climatic being the most important option for the improvement and exploitation of the territory.

Biodiversity - the variety of creatures on our planet - is declining at an increasing rate more alarming in recent years, due to human activities such as change land use, pollution, and climate change.

MATERIAL AND METHODS

The analysis of the thermal and rainfall regime in Brăila Plain was made for the last ten years, respectively the period 2012-2021 through an analysis of annual and multiannual averages. It also shows the influence of zonal climate change on production at SCDA Braila, with phenological observations on major crops, invasive weed species, biodiversity of soil microorganisms and how crops have been affected by rising temperatures and lack of rainfall.

RESULTS AND DISCUSSION

- Temperature is a crucial factor in the various stages of plant growth and development (germination, vegetative growth, flowering, pollination, fruiting) and in the main physiological processes (absorption of water and nutrients, photosynthesis, respiration, transpiration).
- Temperature, along with light and humidity, are the most crucial factors for crops, with optimal growth limits for each species, which determines the zoning of crops, varieties, and hybrids, depending on climatic conditions.
- The impact of global climate change on agricultural crops is manifested by the reduction of plant productivity in relation to their genetic potential because of abiotic and biotic stress, with crop losses caused by extreme weather events such as drought, heat, fires. vegetation, or early frosts, floods, storms, hail, etc.
- The monitoring of the average monthly temperatures for the last 10 agricultural years highlights the fact that the deviation from the multiannual average calculated for the last 100 years is positive every month, between the values of + 0.5°C in October and + 1.75°C in March, which mainly affects the autumn crops, when corroborated with the lack of precipitation (Fig. 1).
- The highest values of the average monthly temperatures are registered in July and August, months in which it is observed based on the statistics performed at SCDA Brăila for the last 10 years, that in these months the precipitations are the lowest, with a deviation of -11,42mm in August and -1.25mm in July (Fig. 2).

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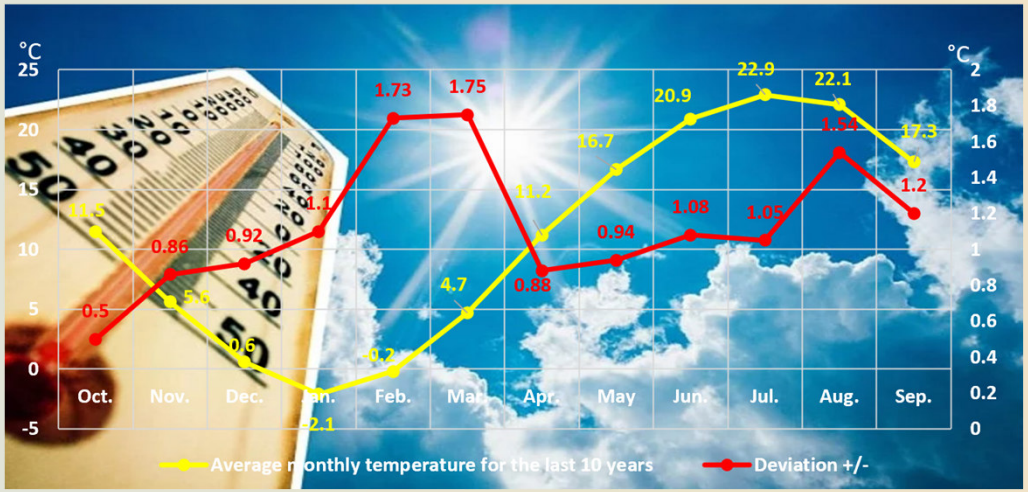

Fig. 1. The graph with average monthly temperature and deviation in the last 10 years

Fig. 2. The graph with average monthly precipitation and deviations in the last 10 years

RESULTS AND DISCUSSION

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To highlight how recent climate change has affected crop types, we have calculated the sum of degrees of useful temperature and the amount of rainfall for each year in the last decade, both for spring crops (April 10 - September 16) and for crops. autumn (October 7 - July 7).

Thus, for the spring crops, GDU and the precipitations registered during the vegetation period, from sowing to harvesting, correlated with the obtained productions, highlighted the fact that in 2018 and 2020 the weakest productions were obtained due to lack of precipitation and burning recorded, while in 2013 and 2017, production was affected by freezing rains.

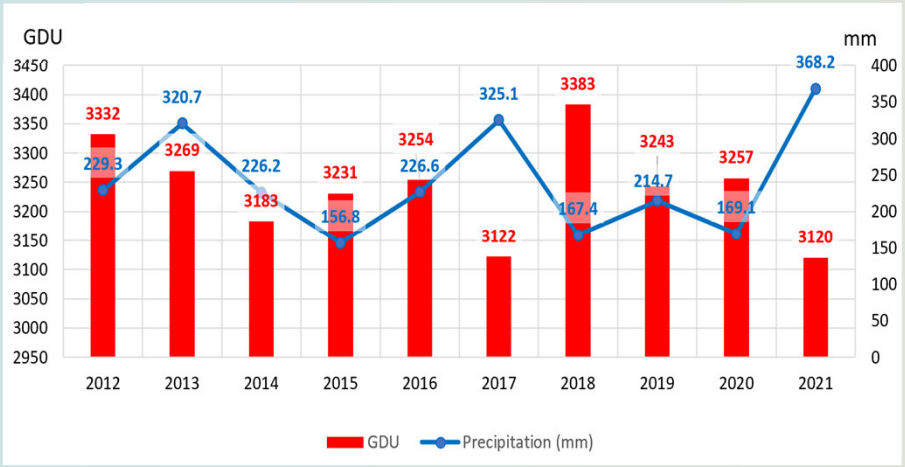

Fig. 3. GDU and precipitation accumulated during the vegetation period in spring crops in the last 10 years, in Braila Plain

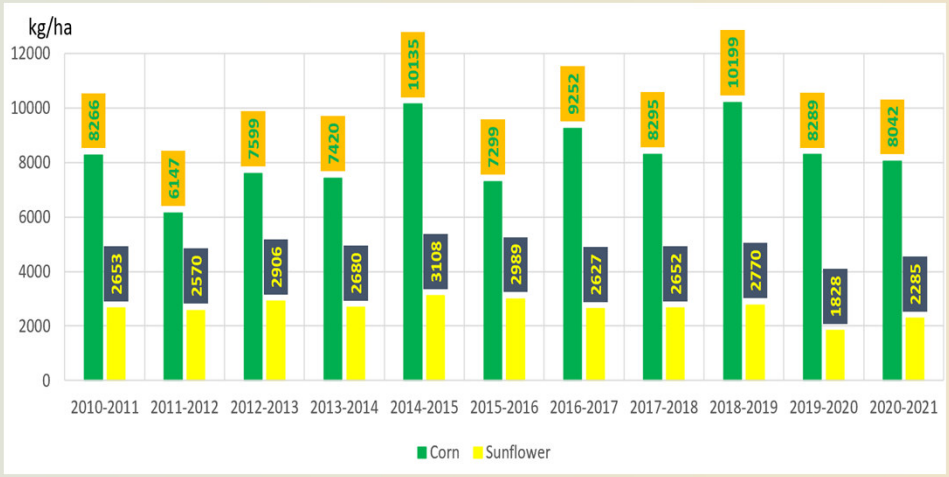

Fig. 4. The average productions obtained for corn and sunflower in the last ten agricultural years, in Braila Plain

Another very important aspect for agriculture and the damage to the biodiversity of agroecosystems is the invasion of adventitious species, which is currently recognized as one of the main threats to biodiversity.

On the lands cultivated by SCDA Braila, *Xanthium spinosum L*, *Amaranthus retroflexus L.*, *Cuscuta campestris Yunck, Ambrosia artemisiifolia* (of South and North American origin), *Echinochloa oryzicola Vasing, Veronica persica* (of Asian origin) can be exemplified as invasive weeds. *Sorghum halepense L.* (of Mediterranean origin), which in agricultural crops become a problem by increasing the incidence of pathogens and pests, increasing the costs needed to control them and reducing productive efficiency per hectare, and in meadows can lead to the elimination of native species, good fodder, producing changes in the succession of phytocenoses, food chains.

RESULTS AND DISCUSSIONS

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For the autumn crops, GDU registered during the vegetation period in the last ten agricultural years, were between the minimum value of 2195°C in the year 2010-2011 and the maximum value of 3038oC in the agricultural year 2019-2020. The lowest productions obtained during this period were in the years when the precipitations were poor during the vegetation period, respectively in the agricultural year 2019 - 2020, in which only 175.6 mm were accumulated, and the productions were of 1822kg / ha for autumn rape, 3023kg / ha for barley and 3314kg / ha for winter wheat, practically halved compared to regular production, followed by 2011-2012, when rainfall was close to harvest, affecting the production of these crops (fig. 5, fig. 6).

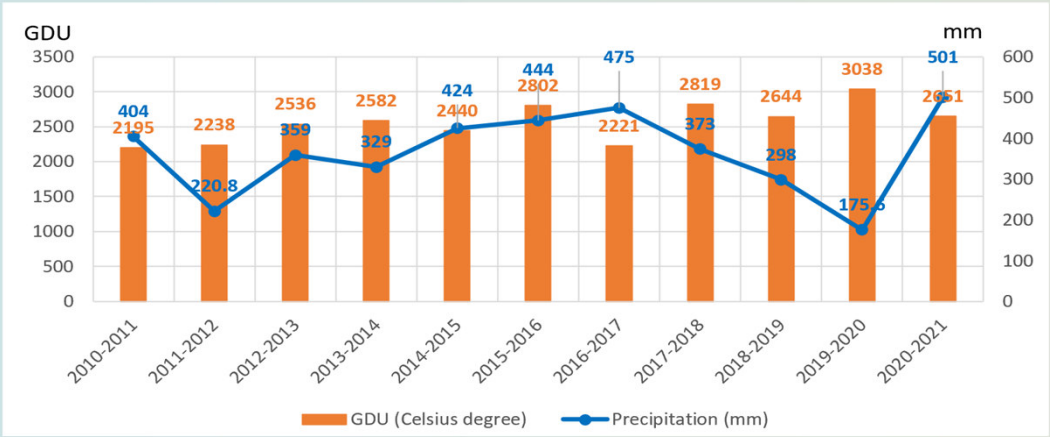

Fig. 5. GDU and precipitation accumulated during the vegetation period in autumn crops in the last 10 years, in Braila Plain

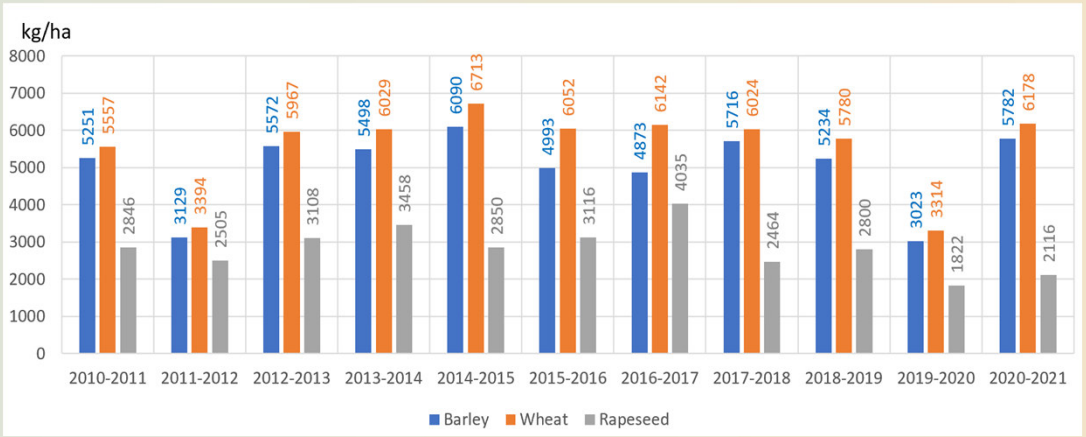

Fig. 6. The average productions obtained for autumn barley, wheat, and rapeseed, in the last ten agricultural years, in Braila Plain

Current climate change also affects soil biodiversity, through degradation, reduction of organic matter content, pollution, compaction, acidification or salinization, waterproofing, but at the same time, climate change affects the biodiversity of soil microorganisms due to rising temperatures, heat, rainfall, which in the Braila Plain have led in recent years to aridification and desertification.

The role of the soil microbiota is considerable and very varied, from humification and mineralization to mycorrhization, fixation of atmospheric nitrogen, solubilization of mineral elements necessary in plant nutrition and plant protection by endophytic fungi. It is known that in temperate regions, each square meter, at a depth of 0 - 20 cm, houses an average of one thousand species of invertebrates, of which 50% arthropods, over 10,000 species of fungi and from 100,000 to one million bacterial species.

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CONCLUSIONS

Food and agricultural production remain among the main drivers of global biodiversity loss.
Agricultural research has a major importance in the diversification of cultivated species, depending on the pedoclimatic conditions and the market which is in a continuous transformation.
Agricultural technologies must be continuously adapted to current and future climate change through the following measures:

- Use of dry-farming technologies (no-till and minim-till), green crops and cover crops, to keep water in the soil and increase the content of organic matter in the soil.
- Digitization of agriculture using soil sensors, prescription maps made with the help of satellites and drones with NDVI cameras, based on which to apply variable rates on fertilization, irrigation, and sowing norms.
- The use of successive crops, to increase productivity per hectare, but also for green crops, in dry years, when due to heat, pollination and fruiting do not occur optimally.
- Introducing sprouting soil or green or legume-growing crops into the crop to enrich the soil with biologically fixed nitrogen through symbiotic bacteria.
- Use of foliar fertilizers, biostimulators and drip irrigation, where there are drip irrigation systems.
- During hot periods, sprinkler irrigation should be done at night, because during the heat, it causes an increase in evapotranspiration.
- Introducing new species into the culture, with varieties and hybrids resistant to abiotic and biotic stressors, as well as the use of pollinating bees.
- Periodic agrochemical analysis of the supply status with nutrients for the preparation of correct fertilization plans

THANK YOU!