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# THE INFLUENCE OF CLIMATE CHANGES ON THE BIODIVERISTY OF CORYLUS GENUS

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## ABSTRACT

*Climate changes have a huge impact on the ecosystems biodiversity changing the relationship among species, which react individually. In Romania, hazelnut (Corylus genus) is a vulnerable species due to its high genetical vulnerability, which require special attention. Thus, recently has been recorded an increased demand for turkish hazelnut for its ecological and economical importance. It has a rapid growth rate, large root system and high tolerance to biotic and abiotic constrainers (pest and diseases, low temperatures, etc.). Moreover it has pharmaceutical benefits, while his fruits has a high oil content. The climate changes induce changes in the species diversity in specific areas and let the door open for new species as an adaptability pattern.*

## INTRODUCTION

The hazelnut (Corylus) is a plant present in Romania, both in culture and in the spontaneous flora, represented by populations, biotypes and cultivation in certain microzones (VICOL et al., 2013). Taking into account the specific biological aspects (emphasis on dichogamy, the need for pollinators) led to the formation of natural hybrids and, finally, biotypes with high genetic variability. This variability requires "in situ" and "ex situ" protection against the phenomenon of increased erosion and genetic vulnerability, with negative effects on genetic resources.

In recent years there is a growing demand for Turkish hazelnut both for its ecological importance and for its fruits BILGISI (2016). With a rapid growth rate, a wide ecological range, an extensive root system and a lack of major treatment for pests or diseases, Turkish hazelnut can help prevent soil erosion (SHAW et al., 2014). The species is also a valuable urban species due to its phytoremediation properties (POPEK et al. 2013) and high potential at low temperatures (GILLNER et al. 2015). Different parts of the plant are a valuable source of natural pharmacological compounds (CEYLAN et al. 2013; RIETHMÜLLER et al. 2014). Its wood is decorative and has favorable mechanical properties (KORKUT et al. 2008; ZEIDLER 2012; 2013). In addition, high oil fruits (ERDOGAN and AYGUN 2005) are not only a quality nutritional source for wildlife (VANDER WALL, 2001), but are also used in the confectionery industry (MILETIĆ et al. 2005).

## MATERIAL AND METHOD

Romania is characterized by a warmer and moderately dry climate, with great variability in terms of monthly rainfall and their distribution. Climate change has a major impact on agriculture, affecting the quantity and quality of production and altering soil water balance, water requirements and vegetation duration. Future climate forecasts show that agricultural areas in Romania may be adversely affected by a number of climate changes that are predicted by regional climate models. Rising temperatures and declining average annual rainfall in many regions of the world are the main climate changes, which have accelerated predominantly in the last three decades (IPCC, 2007), which have brought significant pressure on ecosystems. Maintaining the quality of ecosystems in an optimal environmental balance is of paramount importance, in the context in which they fulfill a series of functions (PRĂVĂLIE et al., 2014). The analyzed region, SW Romania, is currently affected by large-scale aridification, intensified, especially in the last two decades, by the synergistic context of global climate change and soil deterioration, due to inadequate human land management (PĂLTINEANU et al. , 2007; PEPTENATU et al., 2013; PRĂVĂLIE, 2013a, 2013b, 2013c).

The ecological sensitivity of the plant life cycle reflects different life strategies in natural and agricultural areas (WILCZEK et al., 2010). Plant phenology models are important tools in a wide range of aspects, such as agricultural practices, forestry and aerobiology. Phenology is an important bio-indicator of the impact of climate change on ecosystems and useful in predicting the impact of global warming (SCHLEIP et al. ., 2006).

## RESULTS AND DISCUSSIONS

There are two approaches, the main models for studying the impact of environmental change on the persistence of species - the niche model and the mechanical model of the population. On one hand, “niche models” are correlative and focus on the environment, their conceptual background is pursued by multidimensional representation of the niche (Hutchinson, 1957) using measurements of environmental variables and records of species presence and absence to deduce correlations with abiotic factors of a species' niche. By designing this niche on a map with environmental data, the spatial locations that meet the basic requirements of the species are identified. Niche models have been combined with climate projections to predict climate change and species extinction rates (THOMAS et al., 2004). Apart from the methodological warnings of this niche model, namely the change in the covariance of environmental variables (JACKSON et al., 2009), population demography is not in balance with climate change (ARAUJO and PEARSON, 2005), the spatial scale of the analysis (GUISAN and THUILLER, 2005; RANDIN et al., 2009) and the dynamics of individuals to exist outside their niche (PULLIAM, 2000), its major disadvantage is that it does not take into account the biological processes underlying the adaptation of a species to its environment. It cannot identify or incorporate biological differences between species that determine whether or not they may persist in situ. While a new generation of “process-based” (or “mechanistic”) niche models is being developed to overcome these limitations (CROZIER and DWYER, 2006; KEARNEY and PORTER, 2009; MORIN et al., 2008), they are currently based on simplified demographic processes and generally overlook evolution in response to climate change (KEARNEY et al., 2009). The niche model is thus more appropriate today to understand changes in the distribution of appropriate environments for a species on a continental scale than to predict population persistence or guide conservation plans.

The annual time of spring phenophases is largely a response to temperature and reflects the thermal conditions of previous months. As climate change is global, such readjustments are expected to be needed in all areas where hazelnuts are grown on commercial plantations.

Moreover, there has been a weak trend of delayed autumn phenophases, such as leaf fall (MENZEL et al., 2006) and an extension of the growing season due to global warming can be expected. Such new circumstances may provide an opportunity to plant hazelnuts in new areas and may replace some fruit tree crops as economically interesting alternatives.

Due to its ability to adapt to extreme climatic conditions and poor soil conditions, the Turkish hazelnut is a species that plays a key role in climate change scenarios (AYAN et al., 2018). There is evidence for rapid phenotypic evolution in spontaneous flora, especially related to climate change, which indicates that much of the observed phenotypic changes are not genetically determined, but rather caused by phenotypic plasticity (HENDRY et al., 2008). Plasticity can therefore be important for population persistence in a new environment (BALDWIN, 1896; PRICE et al., 2003; GHALAMBOR et al., 2007) and can also facilitate biological invasions (RICHARDS et al., 2006; PRICE and SOL, 2008). Phenotypic plasticity is often genetically variable (SCHEINER, 1993; 2002) and thus can evolve itself. The evolution of plasticity has been modeled in discrete (VIA and LANDE, 1985; VAN TIENDEREN, 1991) or continuous (GOMULKIEWICZ and KIRKPATRICK, 1992; GAVRILETS and SCHEINER, 1993; DE JONG, 1999) environments, the latter being generally formulated using norms. of reaction that give the expected phenotype of a genotype depending on the environment (SCHEINER, 1993).

## CONCLUSIONS

Climate change can accelerate or change the ecology, phenology, production and existence of species. Given that the Oltenia region is one of the hottest areas in Romania, and the frequency of warm winters has been amplified due to the early arrival of spring, in the context of current climate change, plants urgently need strategies to adapt to climate change, such as finding drought and high temperature resistant varieties and hybrids and promoting tolerant varieties, as well as new technologies to counteract the negative effects.

Genetic diversity gives the species the ability to adapt to changes in the environment, including pests and diseases, as well as new climatic conditions. The genetic resources of plants provide the raw material for the creation of new varieties for cultivation. These in turn provide a basis for more productive and resilient production systems, able to cope with stress conditions, respectively drought, high temperatures. Genetic diversity is important in creating new varieties and hybrids through the wide range of valuable genes it offers for the process of genetic improvement. Genetic diversity plays an important role in the survival and adaptation of species.

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