

Drought Tolerance Report

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Problem and the Papers' Relevance

Climate change and global warming are among the most well-known problems of the modern world. These changes bring about numerous issues in a wide variety of areas; however, they have the most significant impact on the environment. Anthropogenic activities have led to the active development of drought, which causes colossal damage to the flora due to its fixed condition (Ilyas et al., 2021). While animals can migrate to water sources, plants cannot do so, which makes them particularly vulnerable. In addition to the damage to the natural environment, many artificially grown crops suffer from drought (Senapati et al., 2019). Such tendencies threaten humanity since people are mainly dependent on vegetable crops. The combination of these factors has led to an exacerbation of the drought problem in recent years.

The relevance of this topic is the reason it is investigated from various angles to find solutions to the existing difficulties. Some articles, like the one by McGregor et al. (2021), focus on examining the most vulnerable characteristics of trees. Since drought seriously affects the planet's forest cover, studying the elements contributing to higher drought tolerance reveals the most sensitive categories requiring the most attention - tall trees with sensitive foliage. Other investigations have concentrated on the functional characteristics observed within species, which enables a more accurate prediction of plant response to drought and determination of the range of species' distribution (López et al., 2021). Examining the intraspecific variety of beneficial traits allows for more effective drought management and creates general mechanistic models. While the two papers explore plants from different perspectives, they share a common theme - drought tolerance research. This allows evaluating them together and comparing them with other papers on this topic to draw complete conclusions.

Critical Comments

The authors of the first reviewed article focus on exploring forest regions (McGregor et al., 2021). They play a massive role in regulating climate and atmosphere; however, the mechanisms of their response to drought remained rather poorly understood (McGregor et al., 2021). Prior investigations often focused only on the results of one immediate event, which is why the authors looked at the major droughts in the last 50 years. This information has been complemented by a study of specific trees at the Forest Global Earth Observatory through measurement and sampling of tree-ring data (McGregor et al., 2021). The main hypothesis was a relationship between tree characteristics, such as their height and leaf cover, with drought resistance. Unlike other papers, such as the work of Ilyas et al. (2021), McGregor et al. (2021) paid attention to general external factors rather to microbiology. This analysis, combined with historical background, allowed the scholars to come up with results sufficient to confirm their hypothesis.

Nevertheless, when evaluating this scholarly paper critically, it is worth noting that the general format of the study is somewhat inconsistent with the classical one. The text lacks sections that allow for a more detailed assessment of the work – for example, the ones highlighting the strengths and weaknesses of the research. Therefore, the results of this work should be approached with caution, and it is worthwhile to combine them with other papers to obtain more relevant conclusions.

In contrast to the work of McGregor et al., the article by López et al. (2021) provides a much more detailed analysis. The authors set out specifically both the goals and the methodology of the work, aiming to obtain specific data on the within-species variation based on ten different sites (López et al., 2021). Biological materials were collected at these sites, which were then subjected to detailed analysis, both physiological and theoretical, through special simulations. In this context,

this article compares favorably with the previous one by the diversity of methods and approaches and the amount of material being studied. In addition, the conclusions drawn from experiments and simulations answer the questions posed in detail while leaving room for further experiments in this area. Combined with a more comprehensive research format, the results of this investigation look more reliable for further use.

Alternative Solutions

In both of the papers reviewed, no specific proposals for further research were put forward. However, several areas can be identified that can be subjected to more careful analysis. In the context of the first work, limited to only 12 species in one location, it is necessary to expand the list of investigated species to include other areas. A meta-analysis by Anderegg et al. (2019) covers more than a hundred species of various woody plants, making it possible to accurately trace the relationship between the species' characteristics and their effect on drought resistance. In addition, such an analysis allows better analyzing the xylem of various types to identify additional factors. Finally, such research opens up the possibility of better studying the boundaries of climatic stress, after which drought becomes fatal for the investigated plants.

Since the second paper focused on identifying within-species factors, it is worth developing this direction. First of all, the already mentioned article by Anderegg et al. (2019) considers multiple species in terms of delineating climatic boundaries, which is consistent with the study results by López et al. (2021). More detailed examinations of drought tolerance and compensation factors will allow better prediction of the distribution boundaries. Secondly, since this investigation aimed to identify a large number of factors, including using theoretical models, it is worth applying them in related areas. For example, they can be implemented in the analysis of systems that allow plants to survive even periods of severe droughts, such as the antioxidant system researched by Laxa et al.

(2019). Since the paper reviewed has demonstrated many approaches to the drought tolerance situation, many directions can be developed further.

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