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Editorial

Plant Biotic and Abiotic Stresses

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In the complex field of plant science, knowledge of the many difficulties that plants encounter from both living and non-living stresses is essential for maintaining biodiversity and managing natural resources in a sustainable manner, in addition to guaranteeing global food security. Biologic stressors, which are brought on by living things (such as bacteria, viruses, fungus, and insects) and have the potential to cause serious harm, financial losses, and food shortages, are a persistent hazard to plants [1–3]. Simultaneously, abiotic stresses impede plant growth, development, and productivity [3,4]. These stresses are caused by non-living elements such as heavy metals, salt, temperature extremes, and water scarcity [5].

The progress made in genetic engineering, molecular biology, and biotechnology has been revolutionary, facilitating the creation of plant types that are resistant to stress [6,7]. These scientific advancements not only improve the ability of crops to withstand challenges but also provide a promising outlook for the implementation of sustainable agriculture methods. The emergence of precision agriculture, driven by Internet of Things (IoT) sensors and artificial intelligence (AI) algorithms, has completely transformed the way plant stressors are monitored and managed [8]. The real-time collection and analysis of data grant the capacity to promptly identify stress indicators, hence permitting timely intervention and implementation of mitigation techniques.

The integrated management strategy is necessary due to the intricate nature of plant stress responses [9]. By integrating conventional agricultural methods with contemporary scientific investigation, it is possible to generate novel and inventive resolutions. For instance, the implementation of crop rotation and the utilization of biopesticides have been shown to effectively mitigate biotic stress [10,11]. Similarly, the incorporation of enhanced irrigation systems and soil amendments has been found to ease abiotic stress [12]. However, the threat of climate change remains significant, intensifying both living and non-living pressures and making it more difficult to combat these difficulties. It is imperative to perform a targeted study to comprehend the intricate relationship between climate change, the interactions between plants and pathogens, and the subsequent reactions to stress.

The need to develop comprehensive models that can accurately forecast the effects of stress and evaluate the efficacy of mitigation techniques cannot be overstated. The effective mitigation of plant biotic and abiotic stresses necessitates a collaborative endeavor involving researchers, farmers, and policymakers. Collaboration is crucial for creating robust agricultural systems that can endure the challenges posed by both living and non-living factors. As we persist in traversing this intricate terrain, the convergence of scientific inquiry and pragmatic implementation will assume a crucial role. By promoting creativity and adopting comprehensive management strategies, the objectives of preserving our crops, guaranteeing food security, and protecting the environment for future generations become more achievable. This research area presents numerous obstacles; however, the potential advantages for both humankind and the environment are extensive and profoundly captivating (Figure 1).

Citation: Manghwar, H.; Zaman, W. Plant Biotic and Abiotic Stresses. *Life* **2024**, *14*, 372. https://doi.org/10.3390/life14030372

Received: 1 March 2024
Accepted: 11 March 2024
Published: 12 March 2024

Figure 1. Strategies for enhancing plant resilience to stresses. (Generated by OpenAI's Whimsical Diagrams for GPT).

Author Contributions: Conceptualization, H.M.; methodology, W.Z.; software, W.Z.; validation, H.M. and W.Z.; investigation, H.M.; resources, W.Z.; data curation, W.Z.; writing—original draft preparation, H.M.; writing—review and editing, W.Z.; visualization, W.Z. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

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