AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 02, Issue: 12 (December, 2025)
Available online at http://www.agrimagazine.in
©Agri Magazine, ISSN: 3048-8656

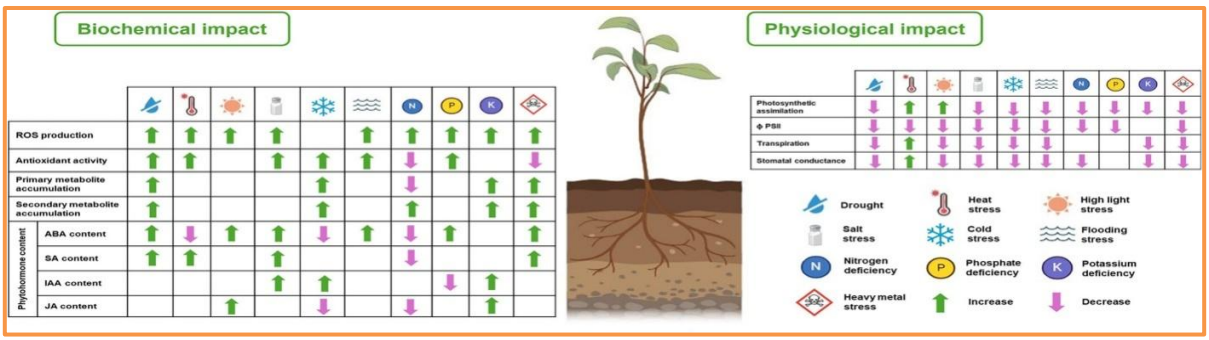
Climate Change and Its Impacts on Agriculture

*Mukesh Bhatheshwar, Vikash Yadav, Rakesh Choudhary and Rahul Yadav
M.Sc. Scholar, CoA, Nagaur, AU, Jodhpur-341001, Rajasthan, India
*Corresponding Author's email: mukeshbhatheshwar12@gmail.com

The productivity of agriculture is significantly influenced by the climate. Many people have expressed worry about the essential role that agriculture plays in human welfare. Groups and others on how agricultural productivity may be impacted by climate change. Over the past ten years, a significant amount of research on climate change and agriculture has been driven by interest in this topic. Hydrologic balances, input supply, livestock and agricultural productivity and other elements of agricultural systems are all predicted to be impacted by climate change [1]. Climate change has direct, biophysical effects on agriculture production because it modifies weather patterns. Determining the final implications of these effects when producers and consumers react necessitates thorough evaluations at each stage in the effect chain from agricultural and economic modelling to the climate [2]. The first topic of discussion is climate change and how it affects the agricultural industry. The approach used is covered in the second section and the hypothesis test by comparing mean differences is presented in the third. The factors are outlined in the fourth section impacting carbon dioxide emissions and the fifth section ends with some suggestions [3].

Effects of climate change on plants

Several physiological systems in plants are impacted by climate change. For example, higher temperatures can speed up transpiration, which increases water stress. Similar to this, extreme weather conditions like heat waves or droughts can cause physiological stress, which can have an impact on respiration, photosynthesis and general plant growth. According to reports, these stressors block photosystem repair activities by increasing the quantities of reactive oxygen species (ROS), which results in photo inhibition [4]. According to a recent study, these biotic and abiotic stresses account for the loss of 30–50% of global agricultural productivity. In addition to this decline in productivity, climate change also poses a threat through a substantial expansion in the distribution of pests and pathogens, which could result in an increased incidence and intensity of plant diseases [5].



Molecular mechanisms regulating plant resilience to climate change

The perception and response to stress involve a variety of signalling molecules, such as reactive oxygen species (ROS), nitric oxide and calcium (Ca2+) which are interconnected to regulate plant growth, The perception and response to stress involve a variety of signalling molecules, such as reactive oxygen species (ROS), nitric oxide and calcium (Ca2+), which

are interconnected to regulate plant growth, development and defence mechanisms. ROS and Ca2+ waves establish an ongoing sequence of cell-to-cell signalling events that propagate from the initial stressed tissue (local tissue) throughout the entire plant (systemic tissues) via a positive feedback loop mechanism [6].

Mitigation and adaptation to climate change

The most significant driver of voluntary mitigation is farmers' assessment of the threat and severity of climate change. Nevertheless, the adaptation is contingent upon the accessibility of relevant data. Additionally, the number of people exposed to water stress will decrease with mitigation techniques; nevertheless, because of their increased stress exposure, the remaining individuals will require adaptation strategies [7].

Major issues and challenges

Making seaweed food items affordable, appealing and available to billions of people is the main obstacle to adopting seaweed as a staple diet. Furthermore, it is difficult to convince these large consumers that seaweed-based foods are nutritionally equivalent to other foods they frequently eat. Seaweed is a completely new food element for many parts of the world and it takes time for any new food product to be accepted by society and globally [8].

Conclusion and Prospects

Changes in crop growth cycles, yields and quality are just a few of the direct effects of global climate change on agricultural production. Other indirect effects include an increase in the frequency and severity of extreme weather events, variations in soil fertility, changes in precipitation patterns and changes in the occurrence patterns of pests and diseases. Additionally, through mechanisms including greenhouse gas emissions, deforestation, changes in land use and supply chains, agricultural operations themselves create feedback loops that contribute to climate change. Given these multidimensional interactions, comprehensive strategies must be adopted to address the challenges posed by climate change [9].

References

1. Aydinalp, C. and Cresser, M. S. (2008). The effects of global climate change on agriculture. *American-Eurasian Journal of Agricultural & Environmental Sciences*, **3**(5), 672-676.
2. Nelson, G. C., Valin, H., Sands, R. D., Havlík, P., Ahammad, H., Deryng, D. and Willenbockel, D. (2014). Climate change effects on agriculture: Economic responses to biophysical shocks. *Proceedings of the National Academy of sciences*, **111**(9), 3274-3279.
3. Pant, K. P. (2009). Effects of agriculture on climate change: a cross country study of factors affecting carbon emissions. *Journal of Agriculture and Environment*, **10**, 84-102.
4. Terán, F., Vives-Peris, V., Gómez-Cadenas, A. and Pérez-Clemente, R. M. (2024). Facing climate change: plant stress mitigation strategies in agriculture. *PhysiologiaPlantarum*, **176**(4), e14484.
5. Bibi, F. and Rahman, A. (2023). An overview of climate change impacts on agriculture and their mitigation strategies. *Agriculture*, **13**(8), 1508.
6. Benitez-Alfonso, Y., Soanes, B. K., Zimba, S., Sinanaj, B., German, L., Sharma, V.and Foyer, C. H. (2023). Enhancing climate change resilience in agricultural crops. *Current Biology*, **33**(23), R1246-R1261.
7. Malhi, G. S., Kaur, M., and Kaushik, P. (2021*). Impact of climate change on agriculture and its mitigation strategies: A review. Sustainability*, *13*(3), 1318.
8. Sultana, F., Wahab, M. A., Nahiduzzaman, M., Mohiuddin, M., Iqbal, M. Z., Shakil, A.and Asaduzzaman, M. (2023). Seaweed farming for food and nutritional security, climate change mitigation and adaptation, and women empowerment: A review. *Aquaculture and Fisheries*, **8**(5), 463-480.
9. Yuan, X., Li, S., Chen, J., Yu, H., Yang, T., Wang, C. and Ao, X. (2024). Impacts of global climate change on agricultural production: a comprehensive review. *Agronomy*, **14**(7), 1360.