Article ID 240205039

A Review on Biotic and Abiotic Stress Management Under Climate Change in Sericulture

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Climate change threatens sustainable agriculture and makes it more difficult for farmers and agricultural researchers to adapt to biotic and abiotic stress issues because of its rapid and erratic effects. The combined effects of climate, which include temperature, precipitation, humidity, and other elements like soil moisture, atmospheric CO2, and tropospheric ozone (O3), will determine the potential impact of global climate change on plant-pest populations. For instance, changes in the number of insect pests that are present could have an effect on the system as a whole or directly affect plants, which could result in different sericulture yields. The vulnerability of raw silk production to climate change is influenced by a variety of factors, including the physiological reaction of the mulberry plant, silkworm rearing, post-cocoon technologies, and variations in the frequency of floods or droughts. (Zandalinas et al., 2021)

Climate change and sericulture

The industry of sericulture is based on agriculture and climate change vulnerability of raw silk production is dependent on numerous factors, such as shifts in the both the frequency of droughts and floods and the the host silkworm's physiological response to the infection plants. Sericulture scientists have predicted the significant impact on the environment caused by climate change technologies for post cocoons, silkworm rearing, and the production of mulberry leaves, all of which have a potential effect on the economy of India. Mulberry leaf yield is expected to be affected by global warming. and the production of raw silk, its content, and silk thread breakage through faltering or turning, water pressure, organic matter, drought, soil acidification and salinization, soil erosion, matter decomposition, and nitrogen fixation pest insects during the growing season, a shorter silkworm growth period, as well as an increased danger of bacterial, viral, and diseases caused by fungi Additionally, sericulture is anticipated to practices in tropical areas like Karnataka and Tamil Nadu West Bengal, Madhya Pradesh, Andhra Pradesh, Assam, Jharkhand, Bihar, and other states will suffer greatly. due to an increase in the average annual temperature of 2 °C or more; However, there are only marginal to small losses in Kashmir, Jammu and Kashmir, and the Sub-Himalayan Eastern North India. Agriculture researchers estimate that sericulture may experience a change in temperate regions loss of between 10 and 20 percent in net revenue.

Objectives

The goal of sericulture stress management in the face of climate change is to improve silk production systems resilience and productivity. Identifying important stressors is necessary for this, creating strains of mulberry and silkworm that are resistant as well as cutting-edge cultivation techniques to reduce the effects of stresses in the environment. In addition, putting integrated pest management into practice, enhancing forecasting and monitoring capabilities, promoting environmentally friendly methods and providing Stakeholder support and education are crucial. The goal of these efforts is to keep silk production steady, economic viability and the industry's long-term viability in the face of climate change.

Materials and methods

Some of the methods investigated to reduce the impact of climate change on mulberry productivity are

***Bombyx mori*- Double hybrid 1**

In terms of economic characteristics like silk productivity and yield per 100 dfls, as well as larval weight, cocoon weight, and shell weight, the double hybrid performed best.

Victoria - genotype 4

Belongs to *Morus indica*. Recently developed from a cross of S-30 and Berc 776 at CSRTI. Recommended during 1996 for assured irrigated conditions. Production characteristics are yields about 70 tonnes/ha/year under assured irrigated conditions. It is a very high sprouting variety. It is moderately resistant to leaf rust and tukra infestation

and resistant to leaf spot. It can quickly sprout and have very high rooting ability (> 94 percent) along with high photosynthetic rate and higher water use efficiency. Moreover, leaves are suitable for both young and grown bivoltine silkworm rearing.

Controlled environments

The ideal conditions include a temperature range of 24 to 28 degrees Celsius, a relative humidity of 65 to 80 percent, and five to twelve hours of sunlight per day. Maintaining these optimum conditions in controlled environment is mandatory. They are provided along with monitoring equipment such as thermometers, hygrometers, CO2 sensors, and data loggers to indicate the exact condition.

Mulberry thrives in locations with 600 to 2500 millimeters of annual rainfall. Due to moisture stress, growth is limited in areas with low rainfall, resulting in low yields. In loamy soils, mulberry requires 340 m3/ha of water every ten days on average, while in clayey soils, it requires 15 days.

Stress in the body was managed through the use of bio-control agents (such as *Chrysoperla carnea* and *Beauveria bassiana*) and the use of chemical pesticides was limited. they are used in cotton ecosystem for protection from aphids and other soft bodied insects. Shade was used as part of abiotic stress management. soil amendments, anti-transpirants, nets, and mulch to improve soil moisture retention. Silkworm growth, quality and yield of cocoons, quality and yield of mulberry leaves, and both were gathered from various articles. The goal of this comprehensive strategy is to make sericulture more resistant to climate change and ensure sustainable manufacturing.

Results and Discussion

The mulberry, which produces a significant amount, is one of the plants with the greatest economic significance. contribution to the economy of India. Both have a significant impact on the production of mulberries worldwide. stresses, both biotic and abiotic. New insights into how were gained through a thorough examination of genotypic differences. best to make use of the available genetic resources. A wave of research and development has been sparked by biotechnology of novel ideas for enhancing mulberries. It has been demonstrated that stable transgenic plants can be produced using a wide range of significant characteristics by employing standard procedures for tissue culture. The abundance of particular up-and-comer qualities given by the Morus genome assets empowered the hereditary designing of moved along plants that can withstand stress and disease in response to changing climate conditions. The transcriptome as a whole, Despite the untapped potential of proteomics, it is anticipated that metabolomic and proteomic research will be conducted. metabolomics as well.

Transgenic Revolution

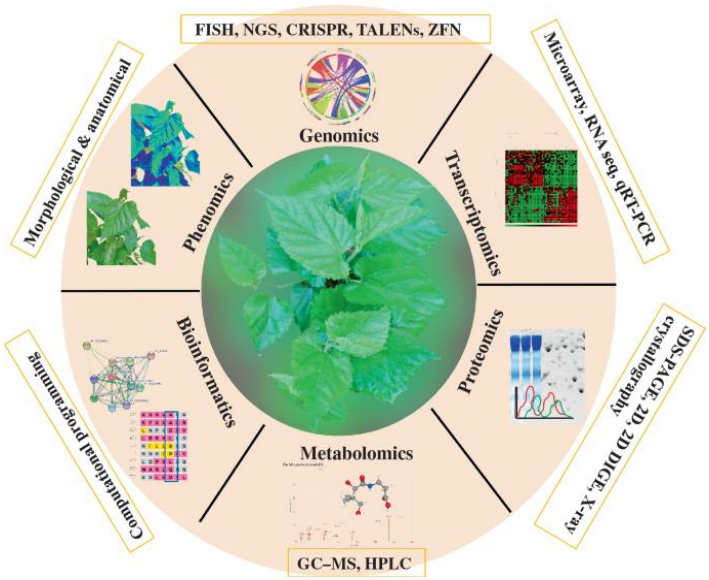
Transgenics based on a specific gene method for introducing genes that are good for us Mulberry's stress tolerance is founded on technologies for the genome that produce useful information regarding the cellular foundations of stress tolerance.

Mulberry Proteomics

Studies in proteomics can a lot to clarify the potential connections between plant stress adaptation and protein abundance since Plants' stress response is directly influenced by proteins.

Mulberry Metabolomics

An integrated view of the biochemical functions of plant genes and the regulatory networks that control plant metabolism is the objective of this methodical research, which is referred to as "metabolomics."



Source: The Mulberry Genome. Compendium of Plant Genomes. Springer, Cham.

Conclusion

It concludes with recommendations the development of genotypes suited for various agro-climatic situations is essential for ensuring the long-term sustainability of the sericulture sector amid global climatic change and the impending scarcity of land and water.

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