Adapting Wheat Farming to Climate Change:
A Comprehensive Review and Prospective Study on Sustainable Agricultural Practices

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Introduction

This study evaluates strategies to adopt sustainable wheat farming methods in the face of climate change and heat stress. It emphasizes the importance of drawing upon plant science and employing novel approaches, such as utilizing cyanobacteria, ancient photosynthetic prokaryotes commonly found in aquatic environments that can thrive in extreme conditions like water scarcity, high temperatures, and nutrient-poor soils, as an innovative solution.

Cyanobacteria offer a sustainable approach by enhancing soil fertility, nutrient uptake, and plant stress tolerance through their ability to form biological soil crusts, fix atmospheric nitrogen, and produce valuable secondary metabolites. [5]

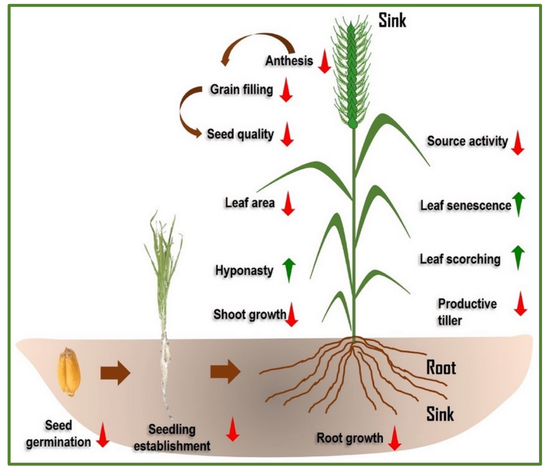
Given the potential for global warming and heat stress in the coming years, cyanobacteria are a compelling solution to strengthen wheat crop resilience and ensure reliable harvests. Their resilience and capacity to mitigate climate change make them a viable eco-friendly alternative to conventional chemical-based agriculture. They facilitate large-scale production of biofertilizers, food, and energy while fortifying wheat crop resilience.

The research identifies knowledge gaps regarding climate change impacts and current farmer adaptation, aiming to inform future studies that will shape policy decisions for sustainable wheat farming.

Heat stress harms wheat growth at all stages

The impact of heat stress on wheat:

- **Reduced photosynthesis, leading to less energy for growth**
- **Earlier leaf death, shortening the growth period**
- **Direct impact on grain production, resulting in lower yields**
- **Stunted growth at all stages:**
  - **Reduced photosynthesis and leaf health**
  - **Decreased grain yield**
  - **Seedling: Slower growth from the sprouting seed**
  - **Tillers: Fewer additional shoots from the base, reducing grain production**

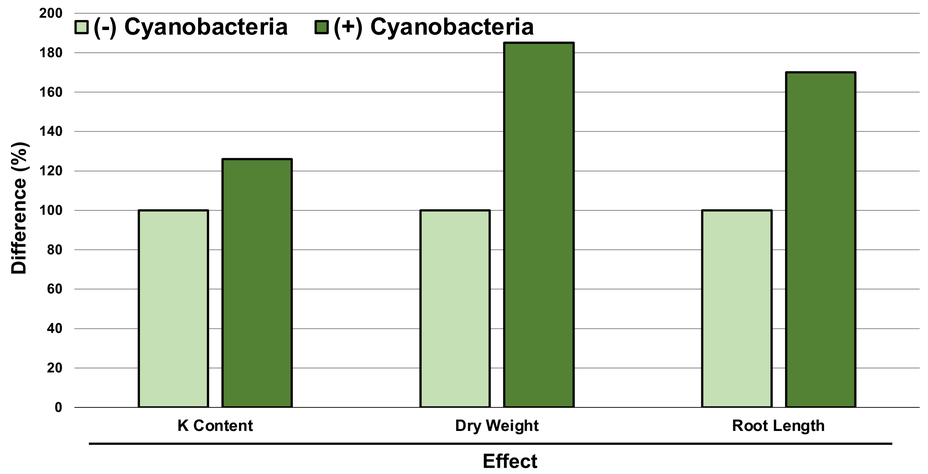


Approaches to Improve Plants

How to make wheat more heat-resistant

Results

Analysis of wheat growth in the absence or presence of cyanobacteria



Cyanobacteria are an effective biofertilizer for wheat

Cyanobacteria:
Leptolyngbya* sp. RBD05** ***Paenibacillus sabinae

Methodology

- **National Library of Medicine**
- **Resources:**
  - Newspapers
  - Scientific journals

Approaches to Improve Soil

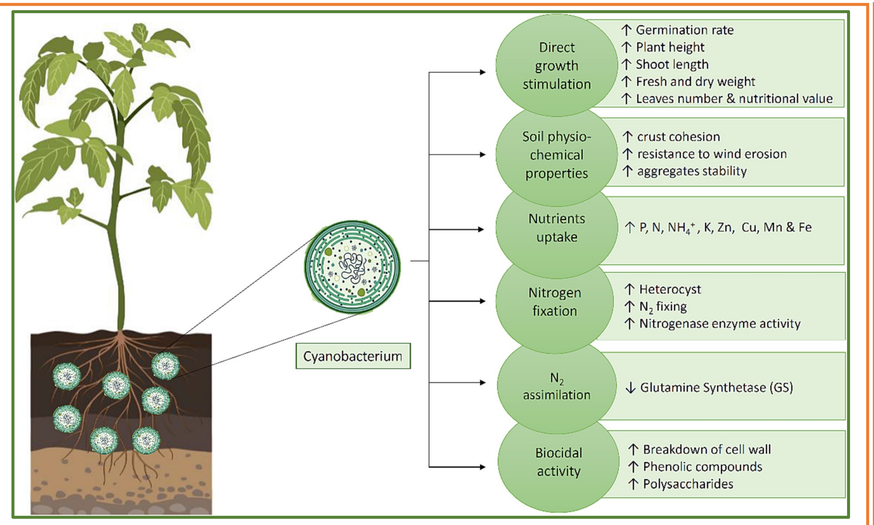
Traditional fertilizers (non-sustainable)

Irrigation (non-sustainable)

Use of Cyanobacteria as a biofertilizer (sustainable)

Benefits of using Cyanobacteria

- Photosynthetic bacteria found in aquatic environments
- Improve nutrients uptake
- Improve Nitrogen fixation
- Improve growth
- Mitigate the effects of climate change.
- More sustainable than traditional practices (chemical fertilizers)



Cyanobacteria could be used as powerful biofertilizer to overcome the climate

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