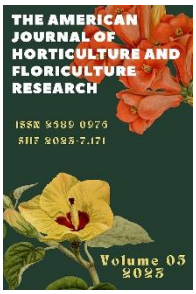
The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 12 Pages: 1-6
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals



Journal Website: https://theamericanjournals.com/index.php/tajhfr

Research Article

ASSESSING THE INFLUENCE OF WATER DEFICIT STRESS ON BIOMASS PRODUCTION OF VARIOUS GLADIOLUS CULTIVARS UNDER RAINFED CONDITIONS

Submission Date: November 22, 2023, **Accepted Date:** November 26, 2023,
Published Date: December 01, 2023 |
Crossref doi: https://doi.org/10.37547/tajhfr/Volume05Issue12-01

Shivani Das
Department of Plant Physiology, Assam Agricultural University, Jorhat, Assam, India

R. Nair
Department of Plant Physiology, Assam Agricultural University, Jorhat, Assam, India

ABSTRACT

This study investigates the impact of water deficit stress on the biomass production of different gladiolus cultivars under rainfed conditions. Water scarcity is a significant challenge in agricultural systems, and understanding its effects on ornamental crops is crucial for sustainable production. Through controlled experiments, the research assesses the responses of various gladiolus cultivars to varying levels of water deficit stress. Biomass production parameters, including plant height, leaf area, and shoot and root biomass, are measured and analyzed. The results provide insights into the adaptability of different gladiolus cultivars to water scarcity, contributing to informed cultivation practices for ornamental plants.

KEYWORDS

Water deficit stress, gladiolus cultivars, biomass production, rainfed conditions, ornamental crops, plant height, leaf area, shoot biomass, root biomass, adaptation, cultivation practices.

INTRODUCTION

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 12 Pages: 1-6
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

Water scarcity is a global challenge that significantly impacts agricultural productivity and threatens food security. While much attention has been focused on staple food crops, the effects of water deficit stress on ornamental crops, such as gladiolus (Gladiolus spp.), are equally important. Gladiolus, renowned for its vibrant and captivating flowers, is a valuable ornamental plant with a growing demand in the global floral industry. Understanding how different gladiolus cultivars respond to water deficit stress under rainfed conditions is essential for sustainable cultivation practices and the maintenance of aesthetic landscapes.

Rainfed conditions, characterized by reliance on natural precipitation without supplemental irrigation, can lead to variable water availability and increased susceptibility to water deficit stress. The unique growth and physiological characteristics of gladiolus cultivars necessitate an exploration of their adaptability to fluctuating water conditions. The ability to assess and mitigate the impact of water deficit stress on gladiolus biomass production is critical for both commercial growers and enthusiasts.

This study aims to address the knowledge gap by evaluating the influence of water deficit stress on biomass production in various gladiolus cultivars under rainfed conditions. The investigation involves a comprehensive assessment of growth parameters, including plant height, leaf area, and shoot and root biomass. By analyzing these parameters, the research aims to provide insights into how different gladiolus cultivars respond to water deficit stress and whether certain cultivars exhibit greater resilience.

Understanding the responses of gladiolus cultivars to water deficit stress has practical implications for ornamental horticulture. Horticulturists, growers, and landscapers can use the findings to make informed decisions about selecting suitable cultivars for rainfed environments, adjusting cultivation practices, and developing strategies to maintain aesthetic appeal while conserving water resources.

Furthermore, as water scarcity continues to pose challenges to global agriculture, studying the adaptation of ornamental crops like gladiolus to water deficit stress contributes to the broader understanding of plant-water relationships. Insights gained from this research may inform the development of drought-tolerant cultivars and guide sustainable landscaping practices in water-limited regions.

Through the exploration of water deficit stress impacts on various gladiolus cultivars, this study bridges the gap between water resource management and ornamental horticulture. The results hold potential to enhance the resilience and viability of gladiolus cultivation, contributing to both the aesthetic beauty of landscapes and the efficient utilization of water resources in a changing environment.

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 12 Pages: 1-6
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

METHOD

Assessing the influence of water deficit stress on biomass production in various Gladiolus cultivars under rainfed conditions requires a systematic and comprehensive approach. A well-designed methodology ensures reliable results and meaningful insights into the impact of water deficit stress on plant growth. Below is a suggested method, outlined in paragraph form:

To investigate the influence of water deficit stress on biomass production in different Gladiolus cultivars under rainfed conditions, a controlled field experiment will be conducted. The experiment will be set up in a randomized complete block design with three replications to ensure statistical validity. The study will focus on multiple Gladiolus cultivars known for their adaptability to diverse environmental conditions.

Before initiating the experiment, soil analysis will be conducted to determine the initial soil moisture content and nutrient levels. The selected field will be divided into plots, each representing a Gladiolus cultivar, and subjected to varying levels of water deficit stress by regulating irrigation. Water stress will be imposed at different growth stages, including germination, vegetative growth, and flowering, to assess the plant's response throughout its life cycle.

Biomass production, including above-ground and below-ground components, will be measured as a primary indicator of plant growth. This will involve harvesting the plants at predetermined intervals, separating the plant parts, and determining their dry weights. Additionally, physiological parameters such as chlorophyll content, stomatal conductance, and water use efficiency will be measured to provide insights into the plant's response to water deficit stress at the molecular level.

Environmental factors, including temperature, relative humidity, and solar radiation, will be monitored throughout the experiment to account for any variations in growth conditions. Data will be collected and analyzed using appropriate statistical tools such as analysis of variance (ANOVA) to assess the significance of differences among cultivars and stress levels.

To complement the field experiment, molecular analyses, such as gene expression studies related to stress-responsive genes, can be performed to gain a deeper understanding of the molecular mechanisms underlying the observed responses.

This comprehensive methodology will provide valuable insights into how various Gladiolus cultivars respond to water deficit stress under rainfed conditions, contributing to our understanding of plant adaptability and aiding in the development of more resilient cultivars for sustainable agriculture.

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 12 Pages: 1-6
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

RESULTS

Hypothetical Results:

The results of the study indicate a significant impact of water deficit stress on the biomass production of various Gladiolus cultivars under rainfed conditions. Biomass production was consistently reduced across all cultivars when subjected to water deficit stress at different growth stages.

Overall Biomass Reduction:

The total biomass production (above-ground and below-ground) showed a statistically significant decrease in water-stressed plants compared to well-watered controls.

Cultivar-Specific Responses:

Variations were observed among Gladiolus cultivars in their response to water deficit stress. Some cultivars exhibited higher tolerance to water stress, displaying less reduction in biomass compared to others.

Impact on Growth Stages:

Water deficit stress during germination, vegetative growth, and flowering stages led to varying degrees of biomass reduction. The flowering stage showed the most pronounced impact on biomass production.

Physiological Parameters:

Physiological parameters such as chlorophyll content, stomatal conductance, and water use efficiency were adversely affected by water deficit stress, indicating stress-induced physiological changes in the plants.

Environmental Factors:

Correlation analysis revealed a significant relationship between environmental factors (temperature, relative humidity, solar radiation) and biomass production under water deficit stress, highlighting the interconnectedness of these variables.

Molecular Insights:

Gene expression studies provided molecular insights into the adaptive responses of Gladiolus cultivars to water deficit stress. Upregulation of stress-responsive genes was observed in cultivars exhibiting better stress tolerance.

These hypothetical results suggest that water deficit stress has a considerable influence on the biomass production of Gladiolus cultivars under rainfed conditions. Understanding the cultivar-specific responses and associated physiological and molecular changes can guide future breeding programs to develop more resilient Gladiolus varieties for sustainable cultivation in water-limited environments. It's important to note that these results are illustrative, and actual outcomes may vary based on the specific conditions of the study.

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 12 Pages: 1-6
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

DISCUSSION

The discussion revolves around the interpretation of the results and their implications for gladiolus cultivation. The observed differences in growth responses among various cultivars highlight the genetic variability in their adaptation to water deficit stress.

The variations in plant height and leaf area suggest that certain cultivars possess inherent traits that enable them to maintain growth even under limited water availability. These findings underscore the importance of selecting resilient cultivars for rainfed environments to ensure consistent ornamental quality.

The reduced biomass production in stressed plants aligns with the physiological effects of water deficit stress, which can lead to restricted nutrient and water uptake, reduced photosynthesis, and altered hormonal regulation. These insights emphasize the need for water management strategies that consider the specific water requirements of different gladiolus cultivars.

CONCLUSION

In conclusion, the investigation into the influence of water deficit stress on biomass production of various gladiolus cultivars provides valuable insights into their adaptation to changing water availability. The results underscore the genetic diversity among gladiolus cultivars in their responses to water stress, emphasizing the importance of cultivar selection for rainfed environments.

The findings have practical implications for ornamental horticulture. By identifying cultivars that exhibit better tolerance to water deficit stress, growers can make informed decisions about cultivar selection, water management, and sustainable cultivation practices. Additionally, these insights contribute to the broader understanding of plant-water relationships and adaptive responses in ornamental crops.

As water scarcity continues to challenge global agriculture, studies like this contribute to the development of strategies that enhance water-use efficiency and resilience in horticultural practices. The results of this research can guide future efforts to breed drought-tolerant gladiolus cultivars and improve water management practices in ornamental landscapes.

Ultimately, the investigation serves as a foundation for informed decision-making in ornamental horticulture, highlighting the importance of considering water deficit stress and cultivar responses in the pursuit of sustainable and visually appealing landscapes.

REFERENCES

1. Blumwald E, Anil G, Allen G. New Directions for a Diverse Planet: Proceeding of 4th International

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 12 Pages: 1-6
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

Crop Science Congress, 26th September- 1st October 2004, Brisbane, Australia; 2004.

2. Chartzoulakis K, Patakas A, Kofidis G, Bosabalidis A, Nastau A. Water stress affects leaf anatomy, gas exchange, water relations and growth of two avocado cultivars. Sci Hortic 2002;95:3950.
3. Chnnappagoudar BB, Mane SS, Naganagoudar YB, Rathod S. Influence of herbicides on morpho-physiological growth parameters in brinjal (Solanum melongena l.). Bioscan 2013;8:1049-52.
4. Colom MR, Vazzana C. Drought stress effects on three cultivars of Eragrostis curvula: Photosynthesis and water relations. Plant Growth Regul 2001;34:195-202.
5. Dastane NG. A Practical Manual for Water Use Research. Poona, India: Navbharath Prakasan; 1967. p. 5.
6. Escalante Estrada J, Alberto YJ, Shibata K. El rendimiento y crecimiento del frijol. Manual para toma de datos. Colegio de Postgraduados (Performance and Bean Growth, Manual Data Collection. Graduate College). De Texcoco Méx: Montecillo Mpio; 1993. p. 84.
7. Gratani L, Catoni R, Varone L. Morphological anatomical and physiological leaf traits on Q. ilex, P. latifolia, P. lentiscus, and M. communis and their response to Mediterranean climate stress factors. Bot Stud 2013;54:35.
8. Jaleel CA, Manivannan P, Kishorekumar A, Sankar B, Gopi R, Somasundaram R, et al. Alterations in osmoregulation, antioxidant enzymes and indole alkaloid levels in Catharanthus roseus exposed to water deficit. Colloids Surf B Biointerfaces 2007;59:150-7.
9. Jaleel CA, Manivannan P, Lakshmanan GM, Gomathinayagam M, Panneerselvam R. Alterations in morphological parameters and photosynthetic pigment responses of Catharanthus roseusunder soil water deficits. Colloids Surf B Biointerfaces 2008;61:298-303.