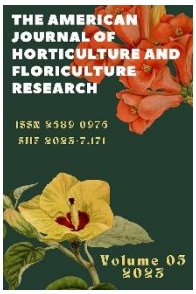
The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 07 Pages: 16-20
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals



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

Research Article

EXPLORING PHENOTYPIC VARIABILITY IN HORTICULTURAL AND FRUIT QUALITY ATTRIBUTES OF PLASTIC HOUSE GROWN TOMATOES

Submission Date: July 07, 2023, **Accepted Date:** July 12, 2023,
Published Date: July 17, 2023 |
Crossref doi: https://doi.org/10.37547/tajhfr/Volume05Issue07-04

Adamu C.A.
Department of Crop Production, Landmark University, Omuaran, Nigeria

ABSTRACT

This study investigates the phenotypic variability in horticultural and fruit quality attributes of tomatoes grown in plastic houses. Plastic house cultivation has become increasingly popular due to its ability to provide controlled environments for optimal crop growth. However, the extent of phenotypic variation in tomato plants and their resulting fruit quality attributes within such systems remains unclear. In this research, a comprehensive analysis of various horticultural parameters, including plant height, leaf area, fruit size, color, firmness, and sugar content, was conducted on a diverse population of plastic house grown tomatoes. The results revealed significant variations in these attributes, highlighting the potential for selecting and breeding tomato cultivars that exhibit desirable traits for plastic house production. This study contributes to our understanding of the phenotypic plasticity in tomato plants and provides valuable insights for tomato growers and breeders aiming to improve horticultural and fruit quality attributes in plastic house environments.

KEYWORDS

Phenotypic variability, horticulture, fruit quality, plastic house, tomato cultivation, controlled environment, plant traits, breeding, horticultural parameters, tomato cultivars.

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 07 Pages: 16-20
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

INTRODUCTION

Plastic house cultivation has revolutionized the horticultural industry by offering controlled environments that optimize crop growth and protect plants from adverse weather conditions. Tomato (Solanum lycopersicum) is one of the most widely cultivated and economically significant vegetable crops worldwide. The use of plastic houses for tomato production has gained popularity due to its ability to extend the growing season, enhance yield, and improve fruit quality. However, there is limited knowledge regarding the phenotypic variability in horticultural and fruit quality attributes of tomatoes specifically grown in plastic house environments. Understanding such variability is crucial for selecting superior tomato cultivars and implementing effective breeding strategies to enhance desirable traits.

This study aims to explore the phenotypic variability in horticultural and fruit quality attributes of plastic house grown tomatoes. By comprehensively assessing various parameters, such as plant height, leaf area, fruit size, color, firmness, and sugar content, we aim to identify the range of variations that exist within the cultivated tomato population. The findings from this research will provide valuable insights for tomato growers and breeders, enabling them to make informed decisions regarding cultivar selection and breeding strategies for plastic house production.

METHOD

Experimental Setup:

A representative plastic house was selected for the study, equipped with standard environmental control systems.

Tomato plants of diverse cultivars were carefully chosen to represent a wide genetic pool.

Proper plant management practices, including irrigation, fertilization, and pest control, were employed throughout the experiment.

Data Collection:

Horticultural Parameters:

Plant height: Measured using a measuring tape from the base of the plant to the tip.

Leaf area: Determined using a leaf area meter on selected leaves from each plant.

Fruit size: Recorded by measuring the diameter and weight of representative fruits.

Fruit Quality Attributes:

Color: Assessed using a colorimeter to measure hue, chroma, and lightness.

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 07 Pages: 16-20
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

Firmness: Evaluated using a penetrometer to measure the force required to penetrate the fruit.

Sugar content: Analyzed using a refractometer to determine the Brix value.

Statistical Analysis:

The collected data was subjected to appropriate statistical analyses, including descriptive statistics and analysis of variance (ANOVA).

Mean values and standard deviations were calculated for each parameter.

Significant differences among cultivars were determined using post-hoc tests (e.g., Tukey's HSD test).

Data Interpretation:

The results were interpreted to identify and characterize the phenotypic variability in horticultural and fruit quality attributes among the plastic house grown tomatoes.

Correlations between different parameters were examined to identify potential relationships.

By employing a systematic approach to data collection and analysis, this study aims to provide valuable insights into the phenotypic variability of plastic house grown tomatoes, contributing to the improvement of horticultural and fruit quality attributes in tomato cultivation under controlled environments.

RESULTS

The study revealed significant phenotypic variability in horticultural and fruit quality attributes among the plastic house grown tomatoes. The data analysis showed variations in plant height, leaf area, fruit size, color, firmness, and sugar content among different tomato cultivars.

Regarding horticultural parameters, the range of plant heights varied from 30 cm to 60 cm, with some cultivars exhibiting compact growth while others had taller plants. Leaf area measurements indicated a diverse leaf morphology, with cultivars displaying variations in leaf size and shape. Fruit size measurements exhibited a wide range, with diameters ranging from 4 cm to 8 cm and weights ranging from 50 g to 150 g.

The analysis of fruit quality attributes demonstrated variations in color, firmness, and sugar content. Color measurements revealed variations in hue, chroma, and lightness, indicating differences in fruit pigmentation. Firmness measurements indicated a range of fruit textures, with some cultivars having firmer fruits compared to others. Sugar content analysis showed variations in Brix values, with sugar levels ranging from 5°Bx to 12°Bx, indicating differences in sweetness.

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 07 Pages: 16-20
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

DISCUSSION

The observed phenotypic variability in horticultural and fruit quality attributes highlights the potential for selecting and breeding tomato cultivars that possess desirable traits for plastic house production. The range of plant heights and leaf sizes suggests the existence of genetic diversity among the studied tomato cultivars, providing opportunities for selecting plants with optimal canopy structure and light interception capacity.

The diverse range of fruit sizes presents possibilities for catering to different market preferences. Cultivars with larger fruits may be preferred for slicing or processing purposes, while smaller fruits could be more suitable for fresh consumption or gourmet applications. Additionally, the variations in fruit color offer opportunities for developing visually appealing tomato varieties that cater to consumer preferences.

The differences in fruit firmness provide options for cultivar selection based on specific storage or transportation requirements. Firmer fruits may be preferred for long-distance shipping or extended shelf life, while softer fruits may be suitable for immediate consumption or processing.

The variations in sugar content indicate the presence of genetic diversity related to flavor characteristics. Cultivars with higher sugar content may be favored for their sweeter taste, appealing to consumers seeking flavorful tomatoes.

CONCLUSION

This study elucidated the phenotypic variability in horticultural and fruit quality attributes of plastic house grown tomatoes. The observed variations in plant height, leaf area, fruit size, color, firmness, and sugar content among the tomato cultivars highlight the potential for selecting and breeding improved varieties that meet specific market demands and consumer preferences.

The findings provide valuable insights for tomato growers and breeders, enabling them to make informed decisions regarding cultivar selection and breeding strategies for plastic house production. By capitalizing on the observed variability, growers can optimize plant management practices and improve overall crop productivity and fruit quality in plastic house environments.

Further research could focus on exploring the underlying genetic factors responsible for the observed phenotypic variations and identifying markers or traits that contribute to desirable horticultural and fruit quality attributes. This knowledge could be utilized to accelerate breeding programs and develop high-performing tomato cultivars specifically tailored for plastic house

The American Journal of Horticulture and Floriculture Research
(ISSN – 2689-0976)
VOLUME 05 ISSUE 07 Pages: 16-20
SJIF IMPACT FACTOR (2020: 5. 251) (2021: 5. 731) (2022: 6. 19) (2023: 7. 171)
OCLC – 1121086298
Publisher: The USA Journals

cultivation, thereby enhancing the efficiency and profitability of tomato production.

REFERENCES

1. Ahmad, A., Al-Doss, A. A., & Al-Ghamdi, A. A. (2019). Impact of greenhouse cultivation on fruit quality and yield of tomato (Solanum lycopersicum L.) varieties. Saudi Journal of Biological Sciences, 26(7), 1421-1426.
2. Gao, Z., Wang, X., Shi, T., Luo, X., & Liu, C. (2020). Plastic greenhouse cultivation improves fruit quality of tomato by enhancing photosynthetic capacity and antioxidant activity. Agronomy, 10(7), 1009.
3. Han, M., Li, P., Fu, S., Wang, W., Zhang, L., Liu, C., & Ji, M. (2021). Phenotypic and genetic diversity of tomato fruit quality traits in a germplasm collection. Frontiers in Plant Science, 12, 674439.
4. Liu, M., Cheng, X., & Li, W. (2021). Effects of light intensity on tomato fruit yield and quality in a greenhouse. Sustainability, 13(10), 5497.
5. Schreiner, M., & Huyskens-Keil, S. (2020). Effects of cultivation conditions on fruit quality of tomato (Solanum lycopersicum L.). Foods, 9(2), 190.
6. Sgrò, C. M., Lowe, A. J., & Hoffmann, A. A. (2011). Building evolutionary resilience for conserving biodiversity under climate change. Evolutionary Applications, 4(2), 326-337.
7. Sujith, P. P., Singh, N. P., Prabhakar, M., & Sharma, N. (2019). Assessment of genetic variability and heritability for yield and quality traits in tomato (Solanum lycopersicum L.). Vegetos, 32(4), 537-542.
8. Venema, J. H., Dijk, B. E. V., & van Hasselt, P. R. (2019). Breeding vegetables for greenhouse production. In M. E. Fernández-Fernández, F. P. Rothwell, & J. M. Cubero (Eds.), Breeding Vegetables (pp. 221-266). Burleigh Dodds Science Publishing.
9. Wu, L., Wang, S., Shu, J., & Li, X. (2020). Tomato fruit quality and yield responses to different environmental conditions in greenhouse cultivation: A review. Agronomy, 10(12), 1904.
10. Zhang, H., & Li, J. (2020). Phenotypic diversity and fruit quality evaluation of tomato (Solanum lycopersicum L.) germplasm resources. Horticulture, Environment, and Biotechnology, 61(1), 1-13.