E-ISSN: 2618-0618
P-ISSN: 2618-060X

NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; 8(12): 1270-1272
Received: 26-10-2025
Accepted: 29-11-2025

T Manvitha
Department of Fruit Science, College of Horticulture, Rajendra Nagar, Delhi, India

A Kiran Kumar
Officer on Special Duty (OSD), Oil Palm -Technical, TGOILFED, Hyderabad, Telangana, India

Corresponding Author:
T Manvitha
Department of Fruit Science, College of Horticulture, Rajendra Nagar, Delhi, India

Effect of ethylene on ripening behaviour and quality attributes of banana (Musa AAA) Cv. Grand Naine

T Manvitha and A Kiran Kumar

DOI: https://www.doi.org/10.33545/2618060X.2025.v8.i12q.4611

Abstract
Ethylene is widely used to regulate ripening in climacteric fruits; however, optimization of its concentration and application frequency is essential to achieve uniform ripening and desirable fruit quality. The present investigation studied the effect of different ethylene concentrations (50, 75, 100 and 125 ppm) and pulsing intervals on ripening behaviour and biochemical quality attributes of banana (Musa AAA) cv. Grand Naine under ambient storage conditions. Total soluble solids (TSS), titratable acidity, reducing sugars and total sugars increased significantly with the advancement of ripening. Fruits treated with 100 ppm ethylene exhibited higher TSS and sugar content compared to lower concentrations, while excessive ethylene accelerated senescence. Among pulsing treatments, four pulsings at 6 h intervals resulted in superior quality attributes and uniform ripening. The study demonstrates that optimised ethylene application can enhance postharvest quality and market acceptability of the banana cv. Grand Naine.

Keywords: Banana, ethylene, ripening, total soluble solids, sugars, postharvest quality

1. Introduction
Banana is one of the most important climacteric fruits globally, valued for its nutritional quality, sensory attributes and year-round availability. Ripening is a complex, genetically regulated process involving coordinated physiological and biochemical changes that lead to development of colour, flavour, aroma and texture. During ripening, starch is hydrolysed into soluble sugars, organic acid metabolism is altered, and cell wall degradation results in fruit softening.
Commercially, bananas are harvested at the mature-green stage and subjected to artificial ripening to ensure uniformity and market readiness. Ethylene, a naturally occurring plant hormone, plays a central role in triggering and regulating ripening in climacteric fruits. However, inappropriate ethylene concentration or exposure may lead to uneven ripening or excessive softening, reducing shelf life. Therefore, optimization of ethylene application is critical for postharvest management of banana.

2. Materials and Methods
2.1 Plant material and ethylene treatment
Banana bunches cv. Grand Naine were harvested at approximately 85% maturity from farmers' fields. Uniform fingers free from mechanical damage were selected. Ethylene was applied using Ripylene canisters in a low-cost ripening chamber at concentrations of 50, 75, 100 and 125 ppm with different pulsing intervals.

2.2 Biochemical analysis
Total soluble solids were measured using a hand refractometer. Titratable acidity was determined by titration and expressed as citric acid percentage. Reducing and total sugars were estimated using the Lane and Eynon method.

2.3 Statistical analysis
The experiment was laid out in a factorial completely randomized design. Data were analysed statistically and treatment means were compared at the 5% level of significance.

3. Results and Discussion

3.1 Total soluble solids

TSS content increased significantly during ripening irrespective of treatment. Fruits treated with 100 ppm ethylene combined with four pulsings at 6 h intervals recorded the highest TSS values, indicating enhanced starch hydrolysis and sugar accumulation.

3.2 Reducing sugars

Reducing sugar content increased progressively with ripening. Higher ethylene concentrations promoted faster conversion of starch into simple sugars.

3.3 Total sugars

Total sugars increased significantly during storage, corroborating the increase in TSS and reducing sugars. Optimized ethylene treatment enhanced sugar accumulation without excessive senescence.

3.4 Titratable acidity

Titratable acidity showed an initial increase followed by a decline during ripening. Higher ethylene concentrations resulted in higher acidity during early ripening stages, which later decreased due to utilization of organic acids as respiratory substrates.

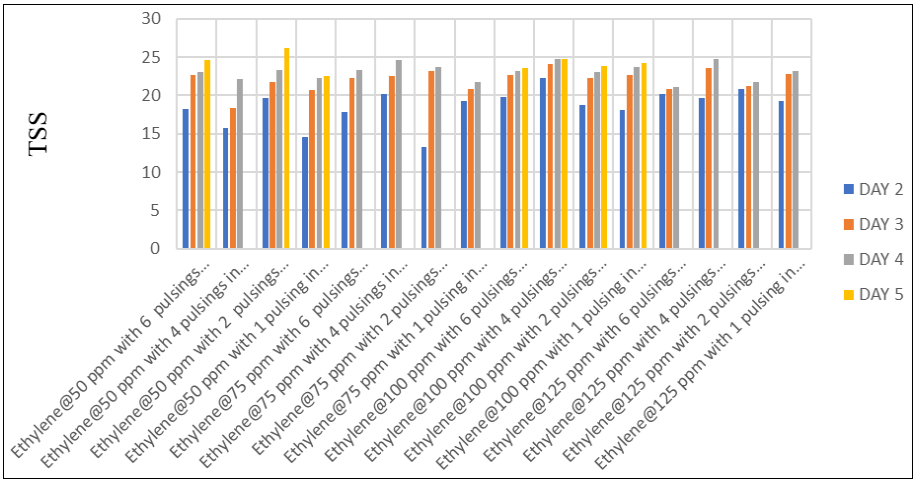

Fig 1: Total soluble solids (%) as influenced by interaction between ethylene concentrations and number of pulsings.

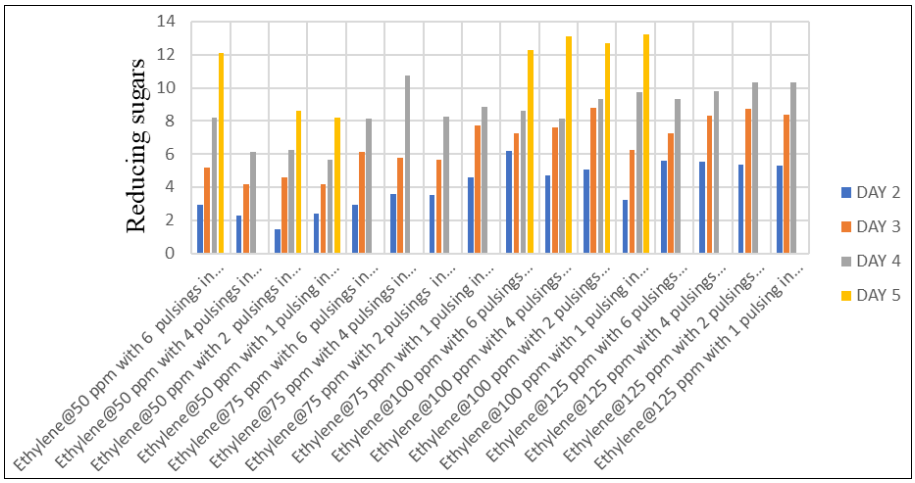

Fig 2: Reducing sugars (%) as influenced by interaction between ethylene concentrations and number of pulsings.

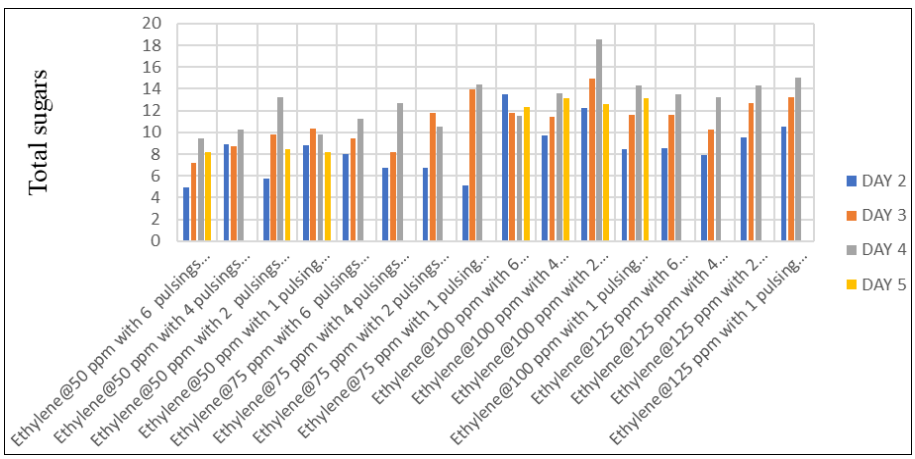

Fig 3: Total sugars (%) as influenced by interaction between ethylene concentrations and number of pulsings

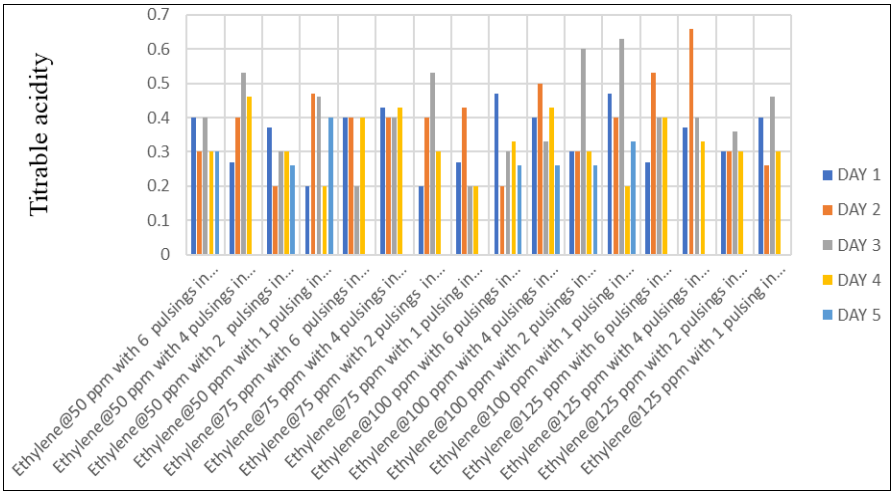

Fig 4: Titrable acidity (%) as influenced by interaction between ethylene concentrations and number of pulsings

4. Conclusion

Ethylene application significantly influenced ripening behaviour and quality of banana cv. Grand Naine. Treatment with 100 ppm ethylene combined with four pulsings at 6 h intervals resulted in uniform ripening, higher sugar content and acceptable acidity. Optimized ethylene management can be effectively used for commercial ripening of banana under ambient conditions.

References

1. AOAC. Official methods of analysis. Washington (DC): Association of Official Analytical Chemists; 1965.
2. Giovannoni J. Genetic regulation of fruit development and ripening. Plant Cell. 2004;16(Suppl):S170-S180.
3. Kader AA. Postharvest technology of horticultural crops. Davis (CA): University of California; 2002.
4. Mahajan BVC, *et al*. Effect of ethylene on ripening and quality of banana. J Food Sci Technol. 2010;47:379-384.
5. McGlasson WB. Ethylene and fruit ripening. HortScience. 1970;5:88-91.
6. Ranganna S. Handbook of analysis and quality control for fruit and vegetable products. New Delhi: Tata McGraw-Hill; 2001.