Original Article

Comparative Analysis on Adaptability of Different *Ploidy Neolamarckiacadamba* to Low Temperature Stress

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Abstract

Aim and Objective: The primary objective of this research endeavour was to examine the correlation between ploidy levels and the capacity to withstand low-temperature stress in Neolamarckiacadamba. The main objectives of this study were to ascertain the ploidy levels prevalent in the population, examine the physiological and molecular responses exhibited, and assess the relative adaptation of plants with tetraploid and octaploid genomes. **Methodology**: Samples were gathered using cytogenetic techniques to reflect different ploidy levels. The plants in the controlled greenhouse trials were exposed to low-temperature stress, and subsequent evaluations were conducted to measure their physiological, biochemical, and molecular responses. The study included statistical methods to ascertain associations, compare responses, and demonstrate statistical significance. **Results**: The findings of the study indicate that there exists a moderate positive link (Pearson coefficient = 0.498) between ploidy levels and adaptability. The results of the regression analysis revealed a statistically significant positive correlation between ploidy levels and adaptability. Data pertaining to physiological, biochemical, and molecular aspects were gathered, and further analysis using ANOVA demonstrated noteworthy variations in growth rates across different ploidy levels when subjected to low-temperature stress. The comparison conducted between tetraploid and octaploid plants revealed that octaploid plants exhibited superior survival rates, growth rates, and photosynthetic efficiency when subjected to low-temperature stress. **Conclusion:** In conclusion, our research investigation enhances our comprehension of the influence of ploidy levels on the adaptability to low-temperature stress in Neolamarckiacadamba. The study revealed a positive correlation between ploidy levels and adaptability, indicating that plants with octaploid ploidy demonstrated enhanced adaptability. The results indicate that variations in ploidy levels have the potential to impact the physiological and molecular reactions to stress, consequently influencing the overall adaptability of plant species.

Keywords: Adaptability, Different Ploidy, *Neolamarckiacadamba*, Low Temperature Stress, Polyploidization, Plant Breeding

Introduction

Kadamba or Kodom, scientifically known as Neolamarckiacadamba (Roxb.) Bosser, belongs to the Rubiaceae family, which is the fourth-largest family of flowering plants. The Rubiaceae family encompasses a vast number of genera, with over 660 and a species count above 11,000.[1,2] The Rubiaceae family, renowned for its notable plant species including Coffea canephora and Ophiorrhiza pumila, serves as a significant reservoir of essential plant alkaloids. According to sources[3,4], The user

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