

## Cloning and Functional Analysis of NtPIN1a Promoter Under Various Abiotic Stresses in Nicotiana Tabacum

**Authors :** Zia Ullah, Muhammad Asim, Shi Sujuan, Rayyan Khan, Aaqib Shaheen, LIU Haobao

**Abstract :** The plant-specific auxin efflux proteins PIN-FORMED (PIN) have been well depicted in many plant species for their essential roles in regulating the transport of auxins in several phases of plant growth. Little is known about the various functions of the PIN family genes in the Nicotiana tabacum (N. tabacum) species during plant growth. To define the expression pattern of the NtPIN1a gene under abiotic stresses and hormone treatment, transgenic tobacco with promoterNtPIN1a::GUS construct was employed. Comprehensive computational analyses of the NtPIN1a promoter confirmed the existence of common core promoter elements including CAAT-box, TATA-box, hormone, and abiotic stress-responsive elements such as ABRE, P-box, MYC, MYB, ARE, and GC-motifs. The transgenic plants with the promoter of NtPIN1a displayed a promising expression of  $\beta$ -glucuronidase (GUS) in germinating seeds, root tips, shoot-apex, and developing leaves under optimal conditions. While the differential expression of GUS in moderate salt, drought, low potassium stresses, and externally high auxin level at two different time points, suggested NtPIN1a played a key role in growth processes and the plants' response to abiotic stresses. This analysis provides a foundation for more in-depth discoveries of the biological functions of NtPIN1a in Nicotiana species and this promoter may be employed in genetic engineering of other crops for enhanced stress tolerance.

**Keywords :** tobacco, nicotiana tabacum, pin, promoter, GUS, abiotic stresses, auxin

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