The responses of genotypes with contrasting NUtE to exogenous ABA during the flowering stage in Brassica napus

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Abstract:【Objective】Abscisic acid (ABA) has been reported to have crosstalk with nitrate (NO_3^-). The aim of this study was to explore the responses of genotypes with contrasting nitrogen utilization efficiency (NUtE) to exogenous ABA during the flowering stage in *Brassica napus*, and to identify candidate genes that may be involved in the regulation of NUtE. **【Method】** In the pot experiment, "Zheyou 18" and "Sollux" were grown in a greenhouse. On the tenth day after flowering, bottom leaves were sprayed with 2 μM ABA. For the hydroponic experiment, plants were treated with 50 μM ABA on the tenth day after flowering. The leaves and roots were sampled after a six-hour treatment for transcriptome analysis. **【Result】** The results showed that ABA application on leaf promoted the N allocation from vegetative organs to grain and increased the number of seeds per silique, grain yield, N harvest index (NHI), and the NUtE in N-efficient rapeseed, while that in the N-inefficient genotype showed a declined trend. After hydroponic ABA treatment, transcriptome analysis showed that there were more differentially expressed genes (DEGs) in the N-efficient genotype than that in the N-inefficient genotype. The DEGs were mainly enriched in N metabolism, ABC transporters, and MAPK signaling pathways. Among them, *Glutamate dehydrogenase* (*GDH*) genes (BnaC09g47860D, BnaC03g03050D) and *Glutamine synthetase* (GS) gene (BnaC03g40250D) was more highly expressed in the leaf of N-efficient genotype than that of N-inefficient genotype after ABA treatment, whereas the opposite expression level was observed in seven genes, including *nitrate transporter* (*NRT*) 2.1 (BnaA06g04570D), *Nitrate Reductase* (*NR*) genes (BnaC06g20690D, BnaA07g20840D), *GSs* (BnaC04g29670D, BnaC08g07930D, BnaA08g29950D, BnaA04g07450D), and Abscisic acid-responsive element binding factor (*ABF*s) genes (BnaC07g44670D, BnaC05g33570D) in the root. **【Conclusion】** the shoot and root of rapeseed may have different response mechanisms to ABA stimulation, and N-efficient rapeseed is more sensitive to ABA treatment than N-inefficient rapeseed, which may be one of the reasons for the difference in NUtE. The study revealed the critical role of ABA in regulating N allocation and utilization in rapeseed with contrasting NUtE and identified several candidate genes involved in the crosstalk between ABA and NO_3^- signaling, which provided target genes for breeding N-efficient rapeseed.