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研究报告

外源一氧化氮对干旱胁迫下杨树光合作用的影响

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摘要

NO是生物体中一种自由基分子，其NO对树木叶片光合作用的影响研究未见报道.本文研究了外源NO对杨树叶片水分状况、光合作用和抗氧化物酶活力的调节作用.不同浓度SNP处理对杨树叶片含水量具有显著影响，杨树叶片含水率随着SNP浓度的提高而增加.当SNP浓度增加到500 μmol·L^{-1}后各处理杨树叶片含水率变化趋于稳定.外源NO能提高水分胁迫下杨树叶片的光合、原初光能转化率 Fv/Fm、Fm/Fo和Fv/Fo 等的比值.其效果随水分胁迫时间的延长而降低.与此对应的是，短时间水分处理（1 h）的杨树叶片SOD和POD抗氧化物酶的活性显著高于长时间(3h)水分胁迫处理.SNP能显著提高不同干旱时间处理组的POD活性，而对SOD活性影响不明显.同时，随SNP浓度的增加，POD和SOD活性呈现先升后降的趋势.因此，干旱胁迫可引起杨树叶片光合效率降低，出现氧化伤害症状，外源NO可诱导抗氧化物酶POD和SOD活性的升高，缓解原初光能转化率Fv/Fm、Fm/Fo和Fv/Fo 等值的降低，从而延缓活性氧积累，减轻水分胁迫对杨树叶片光合作用的影响.

关键词 NO；水分胁迫；杨树；叶绿素荧光参数；保护

分类号

Effects of exogenous nitric oxide on photosynthetic characteristics of poplar leaves under water stress

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Abstract

Nitric oxide (NO) is an active molecule involved in many biological pathways, but its effects on photosynthesis of tree leaves have not been established yet.This paper studied the effects of exogenous NO,sodium nitroprusside (SNP),on the water status,photosynthesis and scavenging enzyme activities in poplar leaves.Different levels of SNP treatments had remarkable effects on the water content of leaves,which increased with increasing SNP levels.When the SNP level exceeded 500 μmol·L^{-1},differences in leaf water content were no longer significant between different SNP treatments.Exogenous NO increased the photosynthesis rate,photochemical efficiency of PSII Fv/Fm ,and Fm/Fo and Fv/Fo ratios,and the effects decreased with increasing duration of water stress.The SOD and POD activities in poplar leaves were higher in 1 hour water stress treatment than in 3 h treatment. Treating with SNP could markedly increase POD activity,but SOD activity did not change much.POD and SOD activities increased initially,and then decreased with increasing SNP levels.The results indicated that exogenous

NO delayed the accumulation of active oxygen by increasing POD and SOD activities,and thereby,alleviated the effects of water stress on photosynthetic organization of poplar leaves.

Key words

Nitric oxide Water stress Poplar Chlorophyll fluorescence parameter Protection

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