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Tropospheric ozone effect on yield, quality and antioxidant defence of six cultivars of jute with ethylene diurea in the lower Gangetic Plains of India

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Abstract

Tropospheric ozone (O_3) is likely to increase in the future due to the increasing emission of related anthropogenic primary pollutants. Therefore, O_3 -induced crop loss assessment becomes relevant during spring and summer as the O_3 concentration is higher due to the longer hours of sunlight and the daily increase in ambient temperatures. Jute (*Corchorus olitorius*) is a very important cash crop, and the livelihoods of about 4.85 million people in India depend on its cultivation during the summer season. In this study, six jute cultivars (JRO 524, JRO 204, JRO 632, IRA, S 19 and NJ 7010) were screened for O_3 tolerance in the lower Indo-Gangetic Plains (IGP) of India through the use of the most responsive biochemical parameters with and without the application of ethylene diurea (EDU). Fibre yield, photosynthetic yield, antioxidant enzymes and malondialdehyde content (MDA) were assessed during the vegetative and maturity growth stages. The most responsive parameters across all cultivars were superoxide dismutase (SOD), catalase (CAT) and malondialdehyde (MDA). The results revealed that O_3 toxicity induces oxidative stress biomarkers, i.e. malondialdehyde (MDA) content, and was manifested by increasing superoxidase dismutase (SOD) and catalase (CAT) in four jute cultivars (JRO 524, JRO 632, IRA and S 19). Two of the jute cultivars, JRO 204 and NJ 7010, are more tolerant to O_3 stress as they had less oxidative damage, higher photosynthetic SPAD value, SOD and CAT activities and lower MDA activity. Prevailing O_3 concentration in the Indo-Gangetic Plains of India may have a negative impact on the growth, yield and quality of jute crops. O_3 -tolerant cultivars can reduce the negative impacts of O_3 on jute fibre production to some extent.

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Data availability

Not applicable.

Code availability

Not applicable.

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Ethics declarations

Conflict of interest

The authors declare no competing interests.

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