

RESEARCH PAPER:

# Amelioration of SO<sub>2</sub> induced phytotoxicity in *Triticum aestivum* L. cv. PBW-343

AWANISH AND NARESH KUMAR

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See end of the article for authors' affiliations

Correspondence to :

AWANISH

Department of Botany,  
Faculty of Science,  
C.C.R. (P.G.) College,  
MUZAFFARNGAR  
(U.P.) INDIA

## SUMMARY

Field experiments were conducted to examine the impact of 1306  $\mu\text{m}^{-3}$  SO<sub>2</sub> on growth, yield and some biochemical parameters of wheat (*Triticum aestivum* L. cv. PBW-343) that grew in closed polythene chambers for 2 h at alternate days. On prolonged exposure, significant reduction on all growth parameters, dry weight fractions, net primary productivity, leaf extract pH, content of chlorophyll and carotenoids pigments, carbohydrate and protein and significant increase in sulphur, anthocyanin, proline and phenolics content was observed. However, when these SO<sub>2</sub> treated plants were periodically sprayed with aqueous solution of either of 0.5% Ca(OH)<sub>2</sub> or 0.5% sodium benzoate or 0.5% potassium ascorbate, changes in above mentioned plant parameters were reduced and SO<sub>2</sub> exposed plants showed better growth. It was noted that with response to SO<sub>2</sub> phytotoxicity potassium ascorbate was better ameliorating agent than sodium benzoate and sodium benzoate was better ameliorating agent than Ca(OH)<sub>2</sub>.

**Key words :** SO<sub>2</sub> pollution, Growth, yield, Biochemical changes, Amelioration

Sulphur dioxide (SO<sub>2</sub>) is one of the major phytotoxic pollutants and emission level of SO<sub>2</sub> is increasing rapidly due to industrialization and urbanization. SO<sub>2</sub> gas is absorbed in mesophyll through stomata of plants and alters the metabolic processes of plants (Jeyakumar *et al.*, 2003), decreases their photosynthetic activity (Black and Unsworth, 1979) leading to considerable loss in crop productivity and yield (Rao *et al.*, 1985; Kumar and Singh, 1986; Rai *et al.*, 2007; Rai and Agrawal, 2008).

The effects of SO<sub>2</sub> pollution have been extensively studied in several crop plants but a little work has been done on amelioration of SO<sub>2</sub>-induced phytotoxic effects in crop plants. The present study was mainly emphasized on amelioration of SO<sub>2</sub>-induced phytotoxicity by spraying aqueous solution of chemical protectants in *Triticum aestivum* L. cv. PBW-343.

## MATERIALS AND METHODS

The present study was conducted at Agricultural Research Farm, C.C.R.(P.G.) College, Muzaffarnagar. Seeds of *Triticum aestivum* L. cv. PBW-343 were sown with line to line distance of 22.5 cm and plant to plant distance of 10 cm in 5 separate beds of 1m x 1m. The fumigation chamber was made up of transparent polythene (1m x 1m x 1m dimension) supported on iron frame. A rubber

tube was fixed to each chamber for entry of SO<sub>2</sub> gas. Small fan was used to circulate the air to reduce leaf boundary layer resistance. SO<sub>2</sub> was produced by passing a continuous current of air through aqueous sodium metabisulphite (Na<sub>2</sub>S<sub>2</sub>O<sub>5</sub>) solution, which is ionized under pressure to produce SO<sub>2</sub> (Agrawal *et al.*, 1982). SO<sub>2</sub> was passed through anhydrous calcium chloride for absorbing moisture from the gas. Gas was introduced within fumigation chamber along with additional flow of air through the perforated alkathene tubes for uniform distribution of gas within chamber. The plants were exposed to 1306  $\mu\text{g}\text{m}^{-3}$  concentration of SO<sub>2</sub> on alternate days for two hours from the date of sowing till maturation in the fumigation chamber in four beds. A control was run in identical condition but without any SO<sub>2</sub> fumigation. Three plots of SO<sub>2</sub> treated plants were sprayed separately with 0.5% aqueous solution of calcium hydroxide, 0.5% aqueous solution of sodium benzoate, 0.5% aqueous solution of potassium ascorbate with the help of atomizer every week and the pH of these ameliorating agents ranged from 6.0 - 8.0.

Four harvests of 10 plants were made at 20 days interval so as to analyze the plants with respect to foliar injury, growth parameters, dry matter production and net primary productivity. At the crop maturation, data on yield

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