

The Effect of SO₂ on element content and visual injury of wheat and barley leaves

Abstract:

The effect of fumigation with (3.0, 3.5, 4.0, 4.5, 5.0 ppm) SO₂ for 2h fumigation chamber on wheat *Triticum aestivum*. cv. yocora rojoe and barley *Hordeum vulgare*. C.V Gestue was investigated.

Fumigation with sulfur dioxide caused increased element content (sodium, sulfur, calcium, magnesium, and iron) in wheat and barley plants, while that of potassium was reduced in both species, and Phosphorus was increased in wheat plants at all concentrations but reduced in barley only at concentrations (4.5 and 5.0 ppm).

The visible injuries of fumigation with sulfur dioxide on the leaves of treated plants were observed 24h after the termination of fumigation. It appeared as necrotic and chlorotic areas which initially appeared along the margins and the apex of the Leaf and gradually extended to the rest of the upper half of Lamina'. The mature Leaves were more severely injured than younger Leaves.

Keywords: Fumigation, Sulfurdioxide, Element, Necrotic, Chlorotic.

yocora Rojoe

(*Triticum aestivum*)

Gestue

(*Hordeum vulgare*)

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(SO₂)

(Krishnayya and Bedi,1989)

(Tung *et al.*, 1995)

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Yocor Rojo *Triticum aetivum* :
 Gestue *Hordeum vulgare*

Fumigation : **Fumigation**
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 .(ppm) , , , and Rao(1981)

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 (Na₂SO₃)
 (HCl)

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 (peat moss)

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Kumar and

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prakash(1990)

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CI-202 Leaf Areameter

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Peach and

(HNO₃)

Tracey,(1956)

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.(Atomic Absorptiom)

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X fluorescence

PW2400

spectroscopy (XRE)

: SO₂

Visible symptoms

(Visible injury)

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"Two way

F "test"

"Least

analysis of variance"

.(Snedecor and Cochran.,1989) ,

significant differences ; L.S.D"

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Muhamad and Latiff (1990),

Kurczynska *et al*(1997) Giertych *et al* (1997) Newsham *et al.*,(1995).Tausz *et al* (1998) Hridlicka and Kula(1998) Muller *et al* (1997)

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±	±	±	±	±	±	
٠,٠٥٩	٠,٠٥٠	٠,٠٣٤	٠,٠٢٨	٠,١٢٢	٠,١٠٥	
'	'	'	'	'	'	
±	±	±	±	±	±	
٠,٠٨٠	٠,٠٣١	٠,٠٣٥	٠,٠٢٧	٠,١٥٩	٠,٠٨٢	
'	'	'	'	'	'	
±	±	±	±	±	±	
٠,٠٦٣	٠,٠٤٢	٠,٠٣٥	٠,٠٢٧	٠,١٥٧	٠,٠٩٤	
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(Pande (Agrawal and Agrawal,1991) (Nandi et al.,1990)

. (Niewiedomska et al.,1995) (Kubo et al,1995) and Jain, 1991)

Muhamad and () ()

Latiff.,(1990)

(Peroxidase)

. (Nandi et al,1990)

Gruber and Luetz.,(1992)

(grana) (Thylakoids)
 .(stroma)

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SO_2

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Agrawal, S.B. and Agrawal, M (1991): Effect of sulfur dioxide exposure on chlorophyll content and nitrogenase activity of *Vicia faba* L. plants. Bull. Environ, Contam. Toxicol 47: 770-774.

Giertych, M.J.; Temmerman, L.O. and Rachwal, L. (1997): Distribution of elements along the length of Scots pine needles in heavily polluted and a control environment. Tree-physiol: 17 (11): 697-703.

Gruber, A.S. and Luetz, C. (1992): Ultra structure of mesophyll cell chloroplasts of spruce needles exposed to O₃, SO₂ and NO₂ alone and in combination. Environ. Exp. Bot., 32 (3) : 243-254.

Hridlicka, P. and Kula, E. (1998): Element content in leaves of birch (*Betula verrucosa* Ehrh.) in an air polluted area. Trees-Struc. func., (13): 2.68-37.

Krishnayya, N.S.R. and Bedi, S. J. (1989): Effect of sulphur dioxide and ascorbic acid on the plastid ultrastructure of *Azadirachta indica* leaves. Annals of Botany 64, 311-313.

Kubo, A. ;Saji, H.; Tanaka, K. and Kondo, N. (1995): Expression of Arabidopsis cytosolic ascorbate peroxidase gene in response to ozone or sulfur dioxide. Plant Molecular Biol. 29: 479-489.

Kumar, N. and prakash, G.(1990): Effect of sulfur dioxide in pigeon pea *Cajanus cajan* (L.) Millsp and pea *pisum sativum* (L.). Acta Bot. Indica 18: 247-251.

Kurczynska, EU.; Dmuchowski, W.; Wloch, W. and Bytnerowicz, A. (1997): The influence of air pollutants on needles and stems of Scots pine *pinus sylvestris* (L.) trees. Environ-pollut. 98 (3) : 325-334.

– **Muhamad, A, and Latiff, A. (1990):** Effect of sulphur dioxide (SO₂) on oil palm (*Elaeis guineensis* Jaq.) seedlings. Malays. Appl. Biol. 19 (1) : 47-55.

Muller, M.; Zelling, G.; Tausz, M.; Wonisch, A.; Kok, L.D.; Sola, G. and Grill, D. and. (1997): Structural change and physiological stress responses of spruce tree to SO₂, O₃ and elevated levels of CO₂. Forestry Sci. 42, 93-102.

Nandi, P.K.; Agrawal , M. and rao, D.N. (1990): Physiological responses of *Vicia faba* plants to sulfur dioxide. *Ectoxic, Environ Safety* 19:64-71.

Newsham, K.K.; Ineson, P. and Frankland, C. (1995): The effects of open – air fumigation with sulfur dioxide on the decomposition of sycamore (*Acer Pseudoplatanus* L.) leaf litters from polluted and unpolluted woodlands. *Plant, cell. Environ.* 18: 309-319.

Niewiedomska, E.; Miszalski, Z. and Moranda, J.(1995): Non-uniform sensitivity to SO₂ within one variegated leaf of *Chlorofpytum comosum*. *Phyton-Horn*, 35 (1) :55-61.

Peach, K. and Tracey, M.V.(1956): Modern Methods of Plant Analyses. Vol. I. Springer. Verlag. Berlin.

Pande, P.C. and Jain, D.K. (1991): Effect of SO₂ and NO₂ pollution on the growth of *Pisum sativum* cv. Phaltham first. *Acta Bot* 19: 123-125.

Prasad, B.J. and Rao, D.N.(1981): Effects of SO₂ exposure on carbohydrate contents, phytomass and caloric values of wheat plants. *Water. Air and Siol pollution* 16:287-291.

Sendecor, G.W. and Cochran, W.G: (1989): Statical Methods Iowa State.Univ. press, Ames. Iowa, U.S.A.

Tausz, M.; Peters, J.; Jimenez, M. S.; Morales, D. and Grill, D. (1998): Element contents and stress, physiological characterization of *Pinus canariensis* needles in Mediterranean type field stands in Tenerife. *Chemosphere* V.36 (4-5) :1019-1023.

Tung, G.; Mcilveen, W.D. and Jones, R.D (1995): Synergistic effect of flyash and SO₂ on development of cucumber (*Cucumis sativus* (L.) leaf injury. *Environ-toxicol-chem.* 14(10): 1701-1710.

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