

Title	Examination of the atmospheric conditions associated with high and low summer ozone levels in the lower troposphere over the Eastern Mediterranean
Author	P. D. Kalabokas, J.-P. Cammas, V. Thouret, A. Volz-Thomas, D. Boulanger and C. C. Repapis
Journal	Atmospheric Chemistry and Physics Discussions
Abstracts	In order to evaluate the observed high rural ozone levels in the Eastern Mediterranean area during summertime, vertical profiles of ozone measured in the period 1994–2008 in the framework of the MOZAIC project (Measurement of Ozone and Water Vapor by Airbus in Service Aircraft) over the Eastern Mediterranean basin (Cairo, Tel-Aviv, Heraklion, Rhodes, Antalya) were analysed, focusing in the lower troposphere (1.5–5km). At first, vertical profiles collected during extreme days with very high or very low tropospheric ozone mixing ratios have been examined together with the corresponding back-trajectories. Also, the average profiles of ozone, relative humidity, carbon monoxide, temperature gradient and wind speed corresponding to the 7% highest and the 7% lowest ozone mixing ratios for the 1500–5000m height layer for Cairo and Tel-Aviv have been examined and the corresponding composite maps of geopotential heights at 850hPa have been plotted. Based on the above analysis, it turns out that the lower-tropospheric ozone variability over the Eastern Mediterranean area is controlled mainly by the synoptic meteorological conditions, combined with local topographical and meteorological features. In particular, the highest ozone concentrations in the lower troposphere and subsequently in the boundary layer are associated with large scale subsidence of ozone rich air masses from the upper troposphere under anticyclonic conditions while the lowest ozone concentrations are associated with low pressure conditions inducing uplifting of boundary layer air, poor in ozone and rich in relative humidity, to the lower troposphere
Year	23 January 2013
Volume and Issue	
Pages	2457–2491
Keywords	

Title	Evaluating the response of two high yielding Indian rice cultivars against ambient and elevated levels of ozone by using open top chambers
Author	Abhijit Sarkar, S.B. Agrawal
Journal	Journal of Environmental Management
Abstracts	A continuous increase in the background level of tropospheric ozone (O ₃) has become a major challenge for present and future agricultural productivity at worldwide. Present study was designed to assess the impact of ambient (present) and elevated (future) concentrations of O ₃ on two cultivars of Indian rice (<i>Oryza sativa</i> L. cvs Malviya dhan 36 and Shivani). Shoot and root lengths, number of leaves and total leaf area were severely affected by both ambient and elevated concentrations of O ₃ . Photosynthetic rate, stomatal conductance and photosynthetic efficiency (F_v/F_m) were also reduced by O ₃ with more drastic effects under elevated levels of O ₃ . Leaf proteome showed reduction of some major proteins due to O ₃ . Pollen viability, viable florets plant ⁻¹ and economic yield also showed significant negative impact under O ₃ -exposure in both the test cultivars. The experimental findings depict that both the cultivars of rice demonstrate differential response against O ₃ , and it may help the plant breeders in selection of resistant cultivars for the area having higher concentrations of O ₃ .
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Volume and Issue	Volume 95
Pages	Pages S19–S24
Keywords	Ozone pollution, Indian rice, Open top chamber, Growth, Yield, Proteome analysis

Title	Physiological and morphological changes in <i>Salix viminalis</i> L. as a result of plant exposure to copper
Author	Monika Gąsecka, Mirosław Mleczek, Kinga Drzewiceka, Zuzanna Magdziak, Iwona Rissmann, Tamara Chadzinikolau & Piotr Golinski
Journal	Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances and Environmental Engineering
Abstracts	The aim of this study was to assess the response of <i>Salix viminalis</i> L. under model conditions to different copper concentrations and, as a consequence, potential application of the experimental results in decontamination of water with heavy metal ions (phytoaccumulation). The 14-day experiment was conducted on one-year-old cuttings of <i>Salix viminalis</i> L. 'Cannabina' exposed, in a phytotron, to six different copper levels in hydroponic pots. The results showed that the capacity to accumulate heavy metals was of the following order: roots > rods > shoots > leaves. The linear relationships between the accumulation efficiency of particular <i>Salix</i> parts were confirmed. Together with an increase in copper sorption in above-ground organs, a decrease was observed in root biomass and the length of roots, shoots and leaves. The release of low molecular weight organic acids into solution was different under various Cu levels. Glucose, fructose and sucrose contents in leaves of <i>Salix</i> in all treatments were higher than in control plants. Higher concentration of sugars (4 times higher compared to the control) was detected for fructose in a 2 mM Cu treatment. The total phenolics content rapidly increased only at 3 mM Cu level. Free and total salicylic acid and the glutathione contents in plants treated with copper in relation to the control were always higher and changed with increasing concentration of copper ions in the medium.
Year	29 Feb 2012
Volume and Issue	Volume 47 Issue 4
Pages	548-557
Keywords	Carbohydrate, copper, glutathione, low molecular weight organic acids, phenolics, salicylic acid.

Title	White clover clones as a cost-effective indicator of phytotoxic ozone: 10 years of experience from central Italy
Author	Cristina Nali, Alessandra Francini, Giacomo Lorenzini
Journal	Environmental Pollution, Volume 157(5)
Abstract	Data collected at one site in central Italy using the NC-S/NC-R clover (<i>Trifolium repens</i>) biotype system during 1997–2007 were analysed in order to assess: (a) its performance under Mediterranean conditions; (b) variations of ozone damage linked with meteorological conditions; (c) if critical level approach is a good predictor of ozone risk on vegetation. NC-S dry biomasses were systematically lower than those of NC-R, the mean ratio being 0.7.

	<p>Relevant relationship between ozone visible injury and cumulated values of AOT40 were also reported. Temperature and number of rainy days were the most important factors associated with ozone presence and, as a consequence, with leaf injury index. Photosynthetic gas exchange properties indicate that NC-S has higher values of stomatal conductance.</p> <p>White clover clones can be successfully used to detect the presence of phytotoxic levels of ozone in the Mediterranean area, completing the data from analysers.</p>
Year	2009
Pages	-
keywords	

Title	Retrospective bioindication of stratospheric ozone and ultraviolet radiation using hydroxycinnamic acid derivatives of herbarium samples of an aquatic liverwort
Author	Saúl Otero, Encarnación Núñez-Olivera, Javier Martínez-Abaigar, Rafael Tomás, Satu Huttunen
Journal	Environmental Pollution, Volume 157(8-9)
Abstract	<p>We analyzed bulk UV absorbance of methanolic extracts and levels of five UV-absorbing compounds (hydroxycinnamic acid derivatives) in 135 herbarium samples of the liverwort <i>Jungermannia exsertifolia</i> subsp. <i>cordifolia</i> from northern Europe. Samples had been collected in 1850–2006 (96% in June–August). Both UV absorbance and compound levels were correlated positively with collection year. p-Coumaroylmalic acid (C1) was the only compound showing a significant (and negative) correlation with stratospheric ozone and UV irradiance in the period that real data of these variables existed. Stratospheric ozone reconstruction (1850–2006) based on C1 showed higher values in June than in July and August, which coincides with the normal monthly variation of ozone. Combining all the data, there was no long-term temporal trend from 1850 to 2006. Reconstructed UV showed higher values in June–July than in August, but again no temporal trend was detected in 1918–2006 using the joint data. This agrees with previous UV reconstructions.</p> <p>On the basis of the levels of p-coumaroylmalic acid in liverwort samples, reconstructions of both ozone and UV radiation showed no significant temporal trend in, respectively, 1850–2006 and 1918–2006.</p>
Year	2009
Pages	2335- 2344
keywords	

Title	Deciduous shrubs for ozone bioindication: <i>Hibiscus syriacus</i> as an example
Author	Elena Paoletti, Anna Maria Ferrara, Vicent Calatayud, Júlia Cerveró, Fabio Giannetti, María José Sanz, William J. Manning
Journal	Environmental Pollution, Volume 157(3)
Abstract	Ozone -like visible injury was detected on <i>Hibiscus syriacus</i> plants used as ornamental

	<p>hedges. Weekly spray of the antiozonant ethylenediurea (EDU, 300 ppm) confirmed that the injury was induced by ambient ozone. EDU induced a 75% reduction in visible injury. Injury was more severe on the western than on the eastern exposure of the hedge. This factor of variability should be considered in ozone biomonitoring programmes. Seeds were collected and seedlings were artificially exposed to ozone in filtered vs. not-filtered (+30 ppb) Open-Top Chambers. The level of exposure inducing visible injury in the OTC seedlings was lower than that in the ambient-grown hedge. The occurrence of visible injury in the OTC confirmed that the ozone sensitivity was heritable and suggested that symptomatic plants of this deciduous shrub population can be successfully used as ozone bioindicators. EDU is recommended as a simple tool for diagnosing ambient ozone visible injury on field vegetation.</p> <p>An Italian population of the deciduous shrub <i>Hibiscus syriacus</i>, a common ornamental species in temperate zones, is recommended as ozone bioindicator.</p>
Year	2009
Pages	865- 870
keywords	

Title	Toward a biologically significant and usable standard for ozone that will also protect plants
Author	Elena Paoletti and William J. Manning
Journal	Environmental Pollution
Abstract	Ozone remains an important phytotoxic air pollutant and is also recognized as a significant greenhouse gas. In North America, Europe, and Asia, incidence of high concentrations is decreasing, but background levels are steadily rising. There is a need to develop a biologically significant and usable standard for ozone. We compare the strengths and weaknesses of concentration-based, exposure-based and threshold-based indices, such as SUM60 and AOT40, and examine the O ₃ flux concept. We also present major challenges to the development of an air quality standard for ozone that has both biological significance and practicality in usage.
Year	2007
Pages	85- 95
keywords	

Title	<i>Tibouchina pulchra</i> (Cham.) Cogn., a native Atlantic Forest species, as a bio-indicator of ozone: Visible injury
Author	Cláudia M. Furlan
Journal	Environmental Pollution
Abstract	<i>Tibouchina pulchra</i> saplings were exposed to carbon filtered air (CF), ambient non-filtered air (NF) and ambient non-filtered air + 40 ppb ozone (NF + O ₃) 8 h per day during two months. The AOT40 values at the end of the experiment were 48, 910 and 12,895 ppb h ⁻¹ ,

	respectively, for the three treatments. After 25 days of exposure (AOT40 = 3871 ppb h ⁻¹), interveinal red stippling appeared in plants in the NF + O ₃ chamber. In the NF chamber, symptoms were observed only after 60 days of exposure (AOT40 = 910 ppb h ⁻¹). After 60 days, injured leaves per plant corresponded to 19% in NF + O ₃ and 1% in the NF treatment; and the average leaf area injured was 7% within the NF + O ₃ and 0.2% within the NF treatment. The extent of leaf area injured (leaf injury index) was mostly explained by the accumulated exposure of ozone (r ² = 0.89; p < 0.05). <i>Tibouchina pulchra</i> , a tropical species widely used in Brazilian landscapes as an ornamental tree, is a potential sensitive bio-indicator of ozone air pollution.
Year	2007
Pages	0- 0
keywords	

Title	Psidium guajava ‘Paluma’ (the guava plant) as a new bio-indicator of ozone in the tropics
Author	C.M. Furlan, R.M. Moraes, P. Bulbovas, A. Salatino and M.J. Sanz
Journal	Environmental Pollution
Abstract	Psidium guajava ‘Paluma’ saplings were exposed to carbon filtered air (CF), ambient non-filtered air (NF), and ambient non-filtered air + 40 ppb ozone (NF + O ₃) 8 h per day during two months. The AOT40 values at the end of the experiment were 48, 910 and 12 895 ppb h ⁻¹ , respectively for the three treatments. After 5 days of exposure (AOT40 = 1497 ppb h ⁻¹), interveinal red stippling appeared in plants in the NF + O ₃ chamber. In the NF chamber, symptoms were observed only after 40 days of exposure (AOT40 = 880 ppb h ⁻¹). After 60 days, injured leaves per plant corresponded to 86% in NF + O ₃ and 25% in the NF treatment, and the average leaf area injured was 45% in NF + O ₃ and 5% in the NF treatment. The extent of leaf area injured (leaf injury index) was explained mainly by the accumulated exposure of ozone (r ² = 0.91; p < 0.05). <i>Psidium guajava</i> ‘Paluma’, a tropical species widely used in Brazilian food industry, is a potential
Year	2007
Pages	691- 695
keywords	