

Visible foliar injury and ecophysiological responses to ozone and drought in oak seedlings

Bárbara Baesso Moura¹, Elena Paoletti^{1*}, Ovidiu Badea^{2,3}, Francesco Ferrini⁴ and Yasutomo Hoshika¹

1. Institute of Research on Terrestrial Ecosystems (IRET), National Research Council of Italy (CNR), Via Madonna del Piano 10, 50019 Sesto Fiorentino, Italy.

2. "Marin Drăcea" National Institute for Research and Development in Forestry 128 Eroilor Blvd., Voluntari 077190, Ilfov, Romania

3. "Transilvania" University, Faculty of Silviculture and Forest Engineering, 1, Ludwig van Beethoven Str., Braşov 500123, Braşov, Romania

4. Department of Agriculture, Food, Environmental and Forestry Sciences, Section Woody Plants, University of Florence, 50019 Sesto Fiorentino, Italy.

* corresponding author: elena.paoletti@cnr.it

Supplementary material

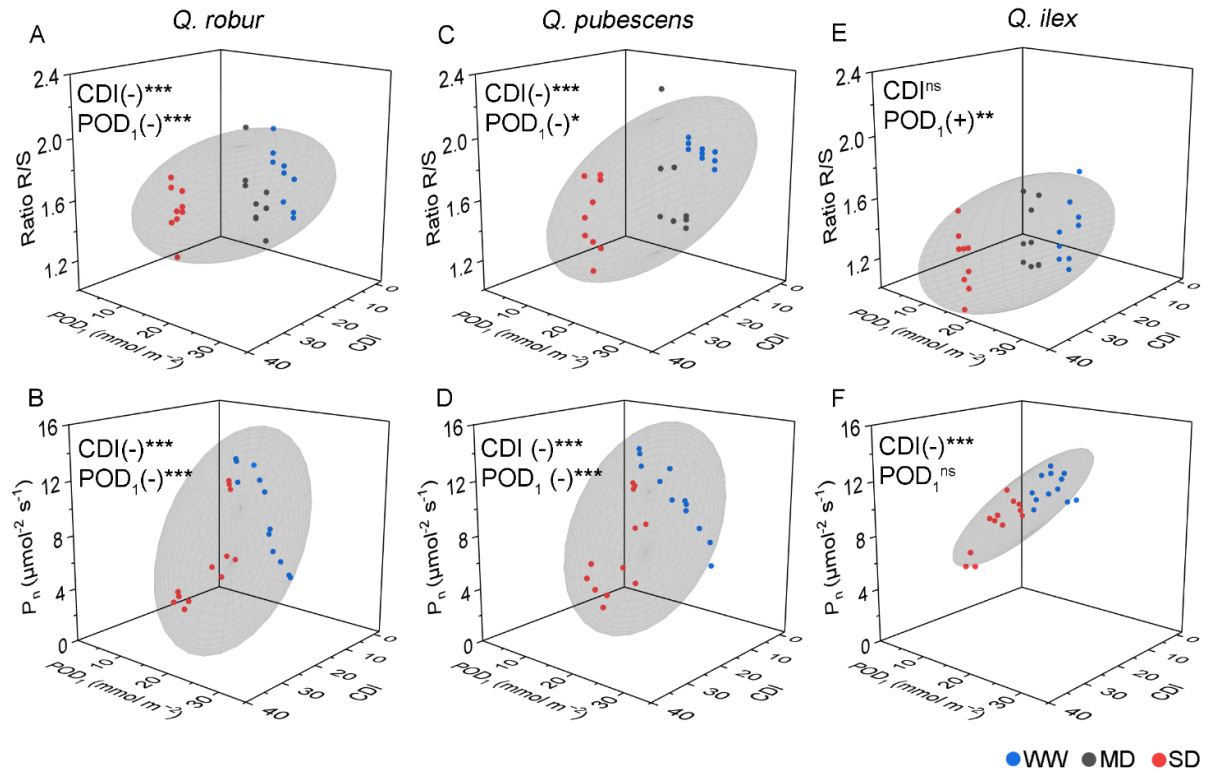


Figure S1. Results of the multiple linear regression, considering Cumulative Drought Index (CDI) and phototoxic O₃ dose (POD₁) as predictor factors, and shoot/root (Ratio R/S) and Photosynthesis (P_n) as dependent parameters. Colored dots represent well-watered (WW - blue), moderate drought (MD - grey) and severe drought (SD - red). Grey ellipsoids represent a confidence level of 75%. (+) positive regression, (-) negative regression, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, ns = not significant.

Table S1. Growth parameters for the species *Q. robur*, *Q. pubescens*, and *Q. ilex*: Plant height increment (cm), Stem diameter increment (cm), and leaf number increment (N. leaves - n). Biomass parameters: Leaf (g), Shoot (g), Root (g), Total biomass (g), and shoot/root (Ratio R/S). Values are the means \pm SE in the different O₃ (AA, $\times 1.2$, $\times 1.4$) and drought (WW, MD, SD) treatments.

Species	Parameter		AA			$\times 1.2$			$\times 1.4$		
			WW-treated	MD-treated	SD-treated	WW-treated	MD-treated	SD-treated	WW-treated	MD-treated	SD-treated
<i>Q. ilex</i>	Growth	Height	16.06 \pm 1.67	17.39 \pm 2.08	15.94 \pm 2.51	18.33 \pm 3.61	15.50 \pm 1.42	14.50 \pm 2.75	16.33 \pm 2.50	17.33 \pm 3.06	18.39 \pm 2.36
		Diameter	2.16 \pm 0.39	2.31 \pm 0.26	2.37 \pm 0.64	3.48 \pm 0.24	2.28 \pm 0.42	2.06 \pm 0.37	2.77 \pm 0.50	2.32 \pm 0.43	3.32 \pm 0.36
		N. leaves	42.1 \pm 8.23	57.3 \pm 6.57	47.2 \pm 9.56	59.3 \pm 6.29	56.6 \pm 1.71	72.7 \pm 11.59	51.28 \pm 6.32	85.50 \pm 14.91	72.00 \pm 13.28
	Biomass	Leaf	4.45 \pm 0.18	4.04 \pm 0.23	3.32 \pm 0.18	4.04 \pm 0.93	3.26 \pm 0.64	5.04 \pm 0.95	3.59 \pm 0.47	4.36 \pm 1.60	3.86 \pm 0.11
		Shoot	7.48 \pm 0.61	7.82 \pm 0.31	6.08 \pm 0.20	8.48 \pm 1.29	6.78 \pm 0.75	6.58 \pm 1.09	7.58 \pm 0.05	6.90 \pm 0.54	6.58 \pm 0.57
		Root	13.0 \pm 0.78	12.4 \pm 0.63	12.5 \pm 0.95	12.5 \pm 1.86	11.5 \pm 0.69	10.9 \pm 1.45	12.9 \pm 0.91	12.2 \pm 1.46	10.8 \pm 0.68
		Total	24.89 \pm 0.26	24.22 \pm 0.80	21.92 \pm 0.54	25.06 \pm 3.91	21.52 \pm 2.05	22.52 \pm 3.45	24.06 \pm 1.35	23.45 \pm 3.57	21.21 \pm 1.15
		Ratio R/S	1.03 \pm 0.03	1.04 \pm 0.07	1.40 \pm 0.26	1.02 \pm 0.10	1.21 \pm 0.05	0.96 \pm 0.05	1.18 \pm 0.05	1.11 \pm 0.08	1.08 \pm 0.02
<i>Q. pubescens</i>	Growth	Height	2.45 \pm 0.2	2.18 \pm 0.42	2.73 \pm 0.25	2.42 \pm 1.34	3.94 \pm 0.77	3.15 \pm 0.21	6.72 \pm 1.15	5.13 \pm 0.81	1.5 \pm 0.36
		Diameter	5.82 \pm 0.77	4.26 \pm 0.7	5.04 \pm 0.51	5.57 \pm 0.28	5.31 \pm 0.71	5.08 \pm 0.62	4.79 \pm 0.38	4.28 \pm 0.61	4.88 \pm 0.54
		N. leaves	88.3 \pm 14.5	60.89 \pm 7.75	74.67 \pm 12.2	85.1 \pm 4.86	120 \pm 12.2	62.1 \pm 0.92	39.8 \pm 3.29	82.7 \pm 16	59.8 \pm 7.24
	Biomass	Leaf	3.43 \pm 0.79	3.01 \pm 0.59	3.65 \pm 0.36	3.77 \pm 0.09	4.48 \pm 0.85	3.29 \pm 0.71	3.04 \pm 0.29	5.23 \pm 1.12	3.59 \pm 0.32
		Shoot	9.84 \pm 0.81	9.17 \pm 1.36	7.19 \pm 0.23	8.17 \pm 0.25	9.37 \pm 0.49	7.92 \pm 0.51	9.02 \pm 1.10	8.28 \pm 0.88	6.64 \pm 0.47
		Root	21.6 \pm 1.16	20.9 \pm 1.29	16.4 \pm 1.98	19.3 \pm 0.80	20.9 \pm 0.74	14.5 \pm 0.81	21.9 \pm 2.70	18.6 \pm 2.52	16.4 \pm 2.51
		Total	35.1 \pm 0.97	33.1 \pm 1.87	27.2 \pm 2.47	31.6 \pm 0.34	34.7 \pm 1.19	25.7 \pm 1.76	33.9 \pm 3.91	32.1 \pm 4.37	26.6 \pm 3.23
		Ratio R/S	1.82 \pm 0.04	1.77 \pm 0.44	1.5 \pm 0.21	1.77 \pm 0.03	1.48 \pm 0.21	1.32 \pm 0.23	1.74 \pm 0.06	1.38 \pm 0.04	1.59 \pm 0.27
<i>Q. robur</i>	Growth	Height	2.78 \pm 1.8	2.52 \pm 0.69	1.6 \pm 0.61	2.35 \pm 0.63	3 \pm 1.5	2.03 \pm 0.57	5.48 \pm 1.77	6.2 \pm 0.61	4.67 \pm 1.76
		Diameter	5.62 \pm 0.55	4.3 \pm 1.2	5.06 \pm 0.52	6.18 \pm 0.55	4.79 \pm 0.71	3.29 \pm 0.37	5.76 \pm 0.41	5.73 \pm 0.42	4.64 \pm 0.65
		N. leaves	187 \pm 26.8	166 \pm 17.3	134 \pm 11.1	190 \pm 17.8	166 \pm 4.86	143 \pm 17.5	177 \pm 13.9	208 \pm 35	117 \pm 12
	Biomass	Leaf	4.93 \pm 0.86	5.15 \pm 0.51	4.58 \pm 0.22	5.25 \pm 0.67	5.46 \pm 0.61	4.41 \pm 0.46	6.17 \pm 0.63	5.90 \pm 1.55	3.93 \pm 0.26
		Shoot	12.5 \pm 1.24	12.4 \pm 2.46	7.71 \pm 0.24	11.6 \pm 1.86	10.4 \pm 1.18	7.62 \pm 0.50	10.6 \pm 2.21	9.66 \pm 2.12	7.21 \pm 0.85
		Root	29.2 \pm 6.04	26.2 \pm 2.32	19.8 \pm 0.63	26.9 \pm 3.59	21.9 \pm 2.06	16.2 \pm 1.50	25.3 \pm 4.55	24.7 \pm 4.74	18.8 \pm 1.56
		Total	46.6 \pm 8.09	43.8 \pm 4.94	32.1 \pm 0.77	43.7 \pm 6.05	37.8 \pm 3.85	28.3 \pm 1.69	42.0 \pm 7.35	40.3 \pm 8.15	29.9 \pm 1.78
		Ratio R/S	1.78 \pm 0.12	1.71 \pm 0.22	1.58 \pm 0.16	1.56 \pm 0.14	1.39 \pm 0.06	1.37 \pm 0.17	1.42 \pm 0.15	1.41 \pm 0.17	1.55 \pm 0.07