



Effect on soybean cultivars (*Glycine max* L. cv. Essex)

The net impact of individual and combined stress on plant growth

Crop: Soybean (*Glycine max* L. cv. Essex, Coker 6955, S53-34)
 Stress 1: UV-B (4.24, 6.36, 8.29 kJ m⁻²)
 Stress 2: Ozone (36, 64 nL L⁻¹)
 Stage of plant: At sowing

The table shows the impact of UV-B irradiance and ozone alone and in combination on yield of soybean plants.

	Treatment	Plant response to stress (reduction over control %)				
		Type A parameters*				
		Pod number	Seed number	Pod weight	Seed yield	100 seed weight
Coker 6955	UV-B (4.24 kJ m ⁻²)	-10.7↑	-0.3↑	-16.7↑	-15.6↑	-13.3↑
	UV-B (6.36 kJ m ⁻²)	-1.7↑	14.2↓	-1.6↑	-0.6↑	-1.6↑
	UV-B (8.29 kJ m ⁻²)	-11.6↑	-6.2↑	-12.5↑	-12.1↑	-7.9↑
	UV-B (4.24 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	-5.4↑	-5.5↑	-1.3↑	0.9↓	0.9↓
	UV-B (6.36 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	6.3↓	16.4↓	9.0↓	11.0↓	-2.5↑
	UV-B (8.29 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	-4.9↑	5.7↓	0.5↓	2.8↓	4.8↓
	UV-B (4.24 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	-16.5↑	-13.5↑	-16.4↑	-16.0↑	0.9↓
	UV-B (6.36 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	-9.9↑	-8.7↑	-14.2↑	-13.2↑	-5.6↑

	UV-B (8.29 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	-15.5	-7.3	-20.0	-18.3	-5.0
Essex	UV-B (4.24 kJ m ⁻²)	4.9	15.0	5.2	6.6	0.9
	UV-B (6.36 kJ m ⁻²)	1.6	15.2	0.4	1.7	-3.0
	UV-B (8.29 kJ m ⁻²)	-5.4	-4.5	-8.2	-8.8	-5.0
	UV-B (4.24 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	-18.8	-17.1	-20.9	-15.9	4.6
	UV-B (6.36 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	-3.3	-5.2	-9.6	-4.4	-2.3
	UV-B (8.29 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	-11.0	-22.5	-18.2	-14.8	-0.7
	UV-B (4.24 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	2.2	3.7	-2.1	-3.0	-5.4
	UV-B (6.36 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	6.0	9.0	-0.1	-1.3	-6.4
	UV-B (8.29 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	0.4	1.4	-2.3	-1.1	-4.1
S53-34	UV-B (4.24 kJ m ⁻²)	0.3	-18.4	0.0	1.7	0.4
	UV-B (6.36 kJ m ⁻²)	-1.8	-11.1	2.3	4.1	4.7
	UV-B (8.29 kJ m ⁻²)	-12.2	-17.8	-7.3	-7.2	5.3
	UV-B (4.24 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	-15.4	-8.1	-13.0	-9.2	-0.2
	UV-B (6.36 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	6.0	10.7	-7.8	-2.6	1.5
	UV-B (8.29 kJ m ⁻²) + Ozone (36 nL L ⁻¹) Simultaneous stress	-8.4	3.3	-9.2	-5.4	1.6

UV-B (4.24 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	-3.8↑	1.3↓	-1.8↑	-0.7↑	-0.5↑
UV-B (6.36 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	-6.5↑	-4.1↑	-6.6↑	-6.3↑	-1.4↑
UV-B (8.29 kJ m ⁻²) + Ozone (64 nL L ⁻¹) Simultaneous stress	-10.6↑	-6.8↑	-8.4↑	-6.1↑	-2.2↑

Reference - Miller JE, Booker FL, Fiscus EL, Heagle AS, Pursley WA, Vozzo SF, Heck WW (1994) Ultraviolet-B Radiation and Ozone Effects on Growth, Yield, and Photosynthesis of Soybean. *Journal of Environmental Quality* 23: 83-91.

Note: *Values presented in the table were calculated using the formula described below.*

$$\text{Reduction over control (\%)} = \frac{(\text{Value}_{\text{Control}} - \text{Value}_{\text{Stress}})}{\text{Value}_{\text{Control}}} \times 100$$

- 1) '↓'- indicates plant parameters affected by stress that lead to high susceptibility (higher the value more the damage).
- 2) '↑' - indicates plant parameters less/not affected by stress leading to improved resistance (higher the value lesser the damage).

'*' - *For more information on parameter classification, please refer to the 'methodology' tab.*

Inference From the study: Miller et.al. studied the interaction of UV-B irradiation and ozone in three soybean cultivars coker6955, essex. S53-34. Three UV-B levels were tested with two concentrations of ozone. Stress was given singly and simultaneously. Pod number and seed number were reduced under combined stress under high ozone treatment with UV, whereas low ozone and UV did not reduce. Pod weight, seed yield, and 100 seed weight did not show reduction under combined stress. **Thus, this stress combination is not detrimental to tested soybean cultivars.**