Effect on sunflower cultivars (*Helianthus annuus* cv. S.28111, Hysun-33, Hysun-39, and SF0049)

The net impact of individual and combined stress on plant growth

The table shows the effect of drought and salinity stress alone and in combination on the growth and physiology of four sunflower cultivars

Crop: Sunflower (*Helianthus annuus* cv. S.28111, Hysun-33, Hysun-39, and SF0049)
Stress 1: Salt 175mM
Stress 2: Drought SMC- 20%
Stage: 30 days after sowing

Cultivars	Treatments	Plant response to stress (reduction over control %)							
		Type A parameter *		Type B parameters *					Type C parameters *
		No. of leaves per plant	Shoot height	gs	PI_{abs}	Fv/Fm ratio	Total chlorphyll content (µg/mg FW) **	Total carotenoid content (µg/mg FW) **	Proline content (µmol/g FW) **
S.28111	Salt stress (175 mM NaCl)	7.83 ↓	15.44 ↓	32.25 ↓	16.90 ↓	4.82 ↓	43.3	0.8	14.3
	Drought (20%)	30.26 ↓	20.97 ↓	63.53 ↓	26.76 ↓	10.84 ↓	41.3	1.2	28.9
	Salt + drought	42.61 ↓	27.52 ↓	81.01 ↓	46.48 ↓	12.05 ↓	41.03	1.8	38.2
Hysun-33	Salt stress (175 mM NaCl)	36.50 ↓	30.58 ↓	31.54 ↓	35.29 ↓	6.25 ↓	26.7	1.1	16.3
	Drought (20%)	43.80 ↓	37.54 ↓	53.94 ↓	42.16 ↓	12.50 ↓	31.13	1.6	30.9
	Salt + drought	60.58 ↓	49.19 ↓	77.60 ↓	68.63 ↓	22.50 ↓	13.22	2.1	38.5
Hysun-39	Salt stress (175 mM NaCl)	12.93 ↓	20.14 ↓	58.35 ↓	10.98 ↓	2.53 ↓	47.4	0.4	13.5
	Drought (20%)	25.85 ↓	28.16 ↓	67.69 ↓	17.07 ↓	7.59 ↓	39.2	0.7	28.7
	Salt + drought	44.22 ↓	43.34 ↓	79.87 ↓	45.12 ↓	15.19 ↓	32.2	1.2	41.3
SF0049	Salt stress (175 mM NaCl)	22.13 ↓	17.75 ↓	53.63 ↓	13.41 ↓	2.53 ↓	37.2	1.6	8.7
	Drought (20%)	26.15 ↓	22.01 ↓	60.51 ↓	21.95 ↓	6.33 ↓	35.8	1.96	12.6
	Salt + drought	38.52 ↓	32.42 ↓	83.45 ↓	29.27 ↓	7.59 ↓	29.6	1.84	24.7

gs- stomatal conductance, PIbs- Performance index, FW- fresh weight.
Control- S.28111 (total chlorophyll content-47.72, total carotenoid content-0.3, proline content-1.4); Hysun33 (total chlorophyll content-43.13, total carotenoid content-0.5, proline content-4.49); Hysun-39 (total chlorophyll content-49.44, total carotenoid content-0.2, proline content-1.7); SF0049 (total chlorophyll content-44.3, total carotenoid content-1.2, proline content-3.7)

For raw data – Click here (.xlsx file)
Reference- Umar M, Siddiqui ZS. (2018) Physiological performance of sunflower genotypes under combined salt and drought stress environment. *Acta Botanica Croatica*. **77(1):**36-44.

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

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

1) '⬇'- indicates plant parameters affected by stress that lead to high susceptibility (higher the value more the damage).

'' - For more information on parameters classification, please refer to 'methodology' tab.*
****- '***Values are presented as it is from the source article without subjecting to the calculation'.*

The inference from the study: The study by Umar *et al.*, 2018 was conducted to understand the effect of drought and salinity alone and in combination on the growth and physiology of four sunflower cv. S.28111, Hysun-33, Hysun-39, and SF0049. Combined stress response was varied across all the four cultivars but showed a higher reduction in growth and physiology under combined stress compared to individual stresses. Among the cultivars Hysun-33 showed higher susceptibility, and SF0049 showed higher resistance to combined stress. **Altogether study indicates the negative effect of combined stress on sunflower cv. cv. S.28111, Hysun-33, Hysun-39, and SF0049.**