

# Production and Physiological Characters of Soybean Under Drought Stress with Foliar Application of Exogenous Antioxidant



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## INTRODUCTION

Drought stress in soybean may affect plant growth, anatomical, morphological, physiological or biochemical aspects (Manalavan *et al.*, 2009). Drought affects plant growth and development with consequence reductions in the rate of cell division and elongation, leaf area, root and stem growth, interrupted stomatal conductance and water use efficiency, which makes photosynthesis very sensitive to drought (Farooq *et al.*, 2009).

## The Aim of the Research

To investigate the effect of the foliar application of exogenous antioxidant on production and physiological characters of soybean under drought stress.

## RESULTS

Parameter observed	Drought stress (K) (% of FC)	Exogenous antioxidant (A)					Mean
		Without exogenous antioxidant (A <sub>0</sub> )	Salicylic acid (A <sub>1</sub> )	Ascorbic acid (A <sub>2</sub> )	α-tocopherol (A <sub>3</sub> )	Chitosan (A <sub>4</sub> )	
Stomatal density	80 (K <sub>1</sub> )	0.85bcde	0.45f	0.84bcde	1.23ab	1.44a	0.96
	60 (K <sub>2</sub> )	0.97bcd	0.88cdef	0.63def	0.88cdef	1.08abc	0.89
	40 (K <sub>3</sub> )	1.00bcd	0.52ef	0.61def	0.68def	0.41f	0.64
	Mean	0.94	0.62	0.69	0.93	0.97	0.83
Chlorophyll Total	80 (K <sub>1</sub> )	4.49a	3.71bcd	3.61bcd	3.61bcd	4.02ab	3.88
	60 (K <sub>2</sub> )	3.99ab	3.54bcd	3.94ab	3.41bcd	3.85abc	3.74
	40 (K <sub>3</sub> )	3.98ab	3.22cd	3.97ab	3.09d	3.16d	3.48
	Mean	4.15	3.49	3.88	3.37	3.68	
Leaf area total	80 (K <sub>1</sub> )	2321.30	1962.95	2746.69	2299.60	2624.54	2044.89
	60 (K <sub>2</sub> )	2110.32	1523.64	2314.76	2355.03	2200.72	1992.84
	40 (K <sub>3</sub> )	1418.34	910.16	1919.00	1785.34	1456.40	1952.03
	Mean	1949.99	1465.58	2326.82	2146.66	2093.88	
100-seeds dry weight	80 (K <sub>1</sub> )	9.15	9.86	8.76	9.00	8.71	9.09
	60 (K <sub>2</sub> )	8.56	9.29	7.93	9.18	9.28	8.85
	40 (K <sub>3</sub> )	9.16	8.38	8.64	8.92	8.40	8.70
	Mean	8.95	9.18	8.44	9.04	8.80	8.88
Number of filled pod	80 (K <sub>1</sub> )	41.22	49.89	40.22	42.78	38.11	41.67
	60 (K <sub>2</sub> )	38.00	41.33	43.00	39.11	41.78	41.29
	40 (K <sub>3</sub> )	37.33	34.56	42.78	40.33	42.56	39.64
	Mean	38.85	41.93	42.00	40.74	40.81	40.87
Relative water content	80 (K <sub>1</sub> )	32.88	33.61	32.81	34.06	36.92	33.13
	60 (K <sub>2</sub> )	32.31	31.36	33.70	30.77	32.32	32.33
	40 (K <sub>3</sub> )	29.55	27.93	28.43	26.35	25.62	28.26
	Mean	31.58	30.97	31.65	30.39	31.63	31.24

## MATERIALS AND METHODS

- ❖ The research was arranged in a Factorial Randomized Block Design with two factors and three replicates was used.
- ❖ The first factor is drought stress treatment :
  - ❖ 80%,
  - ❖ 60% } of field capacity (FC).
  - ❖ 40%
- ❖ The second factor is foliar application of exogenous antioxidant :
  - ❖ Without exogenous antioxidants
  - ❖ 500 ppm of salicylic acid
  - ❖ 500 ppm ascorbic acid,
  - ❖ 500 ppm of α-tocopherol
  - ❖ 1 mg/mL of chitosan
- ❖ Foliar application of exogenous antioxidant carried out in accordance concentrations on 2 week after planting (WAP) to R6 with interval once a week.

## CONCLUSION AND OUTLOOK

- Increased drought stress conditions caused for decreasing of stomatal density, total chlorophyll, total leaf area, relative water content, number of filled pods and 100-seeds dry weight.
- Effect of foliar application of exogenous antioxidants on drought stress showed the important of the role of exogenous antioxidants in reducing the effect of water stress on production and physiological characters of soybean.

## References

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- Manalavan, L.P., Satish K. Guttikonda, Lam-Son Phan Tran and Henry T. Nguyen. 2009. Physiological and Molecular Approaches to Improve Drought Resistance in Soybean. *Plant Cell Physiol.* 50(7):1260-1276.

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