



Effect on barley genotypes

1. The net impact of individual and combined stress on plant growth of barley Australian cv. Keel and Syrian landrace Arta

Plant- Barley  
Stress 1- Drought  
Stress 2- Heat

Table showing the effect of individual and combined stress on yield and attributing physiological traits

Parameters studied	Genotypes	Plant response to stress (reduction over control %)			Parameter type *
		Drought stress (15% FC)	Heat stress (36/32 °C for seven days)	Combined stress (Drought + heat)	
Grain yield	Arta	96.7 ↓	110.7 ↓	268.8 ↓	Type A
	Keel	51.9 ↓	82.8 ↓	303.4 ↓	
Total biomass	Arta	52.2 ↓	10.7 ↓	68.3 ↓	
	Keel	37.1 ↓	11.3 ↓	111.2 ↓	
Harvest index	Arta	27.3 ↓	93.1 ↓	124.0 ↓	
	Keel	11.8 ↓	62.8 ↓	90 ↓	
Plant height	Arta	27.5 ↓	10.5 ↓	15.9 ↓	
	Keel	5.2 ↓	3.3 ↓	15.9 ↓	
Spike number	Arta	51.7 ↓	-12.7 ↑	22.2 ↓	
	Keel	26.1 ↓	-16.9 ↑	49 ↓	
Number of aborted spikes**	Arta (Control- 4)	3	11	9	
	Keel (Control- 0)	2	6	3	
Grains per spike	Arta	8.9 ↓	14.0 ↓	13.0 ↓	
	Keel	7.1 ↓	16.3 ↓	21 ↓	
Thousand kernel weight	Arta	9.1 ↓	41.4 ↓	67.9 ↓	
	Keel	-0.9 ↑	45.1 ↓	67.7 ↓	
Days to maturity	Arta	0	-7.2 ↑	-6.3 ↑	Type B
	Keel	0	-5.4 ↑	-2.2 ↑	
Total water used per plant (liters) **	Arta (Control- 7.54 litres)	3.45	7.65	3.61	
	Keel (Control- 6.7 litres)	3.42	6.65	3.21	
Water use efficiency	Arta	-11.1 ↑	128.6 ↓	77.8 ↓	
	Keel	-26.1 ↑	70 ↓	88.9 ↓	
Relative water content on day 7	Arta	8.1 ↓	17.8 ↓	36.3 ↓	
	Keel	5 ↓	6.7 ↓	33.7 ↓	
Maximum PSII quantum yield at day 7	Arta	-0.6 ↑	6.0 ↓	8.9 ↓	
	Keel	-1.5 ↑	10.3 ↓	42.4 ↓	

FC- field capacity

For raw data – Click here (.xlsx file)

For genotype study- Click here (.pdf file)

Reference- Rollins *et al.*, 2013

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

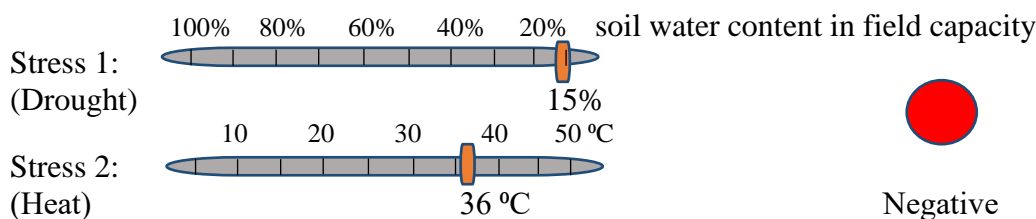
$$\text{Reduction over control (\%)} = \frac{(\text{Value Control} - \text{Value Stress})}{\text{Value Control}} \times 100$$

- 1) '0' - indicates plant was not affected by stress.
- 2) '↓' - indicates plant parameters affected by stress that leads to high susceptibility.
- 3) '↑' - indicates plant parameters less/not affected by stress leading to improved resistance.
- 4) Control plants maintained at soil water content of 50% FC and 21/17 °C day/night temperature.

'\*' - For more information on parameters classification, please refer to 'methodology' tab.

'\*\*' - Values represented as it is from the source article (without subjecting to calculation).

### Bar showing net impact of combined stress over control



**Note:** The bar is drawn based on 'type A' parameter, i.e., grain yield, total biomass, and harvest index. When the cursor dragged, an interaction between two levels of stress shown as a negative outcome (*red*- plants are more affected under combined stress compared to individual stresses) or positive outcome (*green*- plants are less affected under combined stress compared to individual stresses).

**The inference from the study:** Rollins *et al.*, 2013 study aimed to identify leaf proteins differentially regulated in response to drought, heat and combined stress in the context of the morpho-physiological changes in barley Australian cv. Keel and Syrian landrace Arta. Plant growth and physiology were affected by all stress treatments, and severity was more under combined stress as compared to individual stresses in both the genotypes. Again the response of both the genotypes to individual stresses was varied across the parameters. Keel plants showed a lesser reduction in yield, biomass, harvest index, plant height, spike number, grains per spike, thousand kernel weight, WUE, relative water content and PSII quantum yield under individual drought and heat stress compared to Arta. However, under combined stress keel showed higher sensitivity as compared to Arta. **All together results indicated that stress response varied across the barley genotypes (Keel and Arta) and plants showed higher sensitivity to combined stress compared to individual stresses.**