



Effect on wheat cultivars (*Triticum aestivum* cv. Nourin-61, Chikugo Izumi, Shirasagi Komugi, Blue Silver)

The net impact of individual and combined stress on plant growth

Crop: Wheat (*Triticum aestivum* cv. Nourin-61, Chikugo Izumi, Shirasagi Komugi, Blue Silver)
 Stress 1: Salt (100mM NaCl)
 Stress 2: Hypoxia
 Stage of plant: 9 days after germination

The table shows the effect of hypoxia and salt alone and in combination on growth and physiology of wheat cultivars.

| | Treatment | Plant response to stress (reduction over control %) | | |
|------------------|---|--|--------------|-----------------|
| | | Type A parameters* | | |
| | | Root length | Shoot length | Root dry weight |
| Nourin-61 | Hypoxia | 41.8↓ | 1.0↓ | 17.3↓ |
| | Salt (100mM NaCl) | 42.9↓ | 13.2↓ | 43.6↓ |
| | Salt (100mM NaCl) + Hypoxia (Simultaneous stress) | 58.5↓ | 22.1↓ | 51.2↓ |
| Chikugo Izumi | Hypoxia | 36.8↓ | 0.9↓ | 16.9↓ |
| | Salt (100mM NaCl) | 53.2↓ | 22.7↓ | 51.9↓ |
| | Salt (100mM NaCl) + Hypoxia (Simultaneous stress) | 60.6↓ | 25.8↓ | 65.7↓ |
| Shirasagi Komugi | Hypoxia | 43.6↓ | 5.0↓ | 29.1↓ |
| | Salt (100mM NaCl) | 43.2↓ | 15.7↓ | 40.9↓ |
| | Salt (100mM NaCl) + Hypoxia (Simultaneous stress) | 60.0↓ | 26.3↓ | 54.8↓ |

| | | | | |
|------------------|--|--|-----------------------------|---------------------|
| Blue Silver | Hypoxia | 42.1↓ | 5.9↓ | 18.5↓ |
| | Salt (100mM NaCl) | 57.0↓ | 27.2↓ | 47.2↓ |
| | Salt (100mM NaCl) + Hypoxia (Simultaneous stress) | 68.0↓ | 34.7↓ | 55.8↓ |
| Treatment | Plant response to stress (reduction over control %) Type A parameters* | Plant response to stress (reduction over control %) Type B parameters* | | |
| | | Shoot dry weight | Root/Shoot ratio dry weight | Chlorophyll content |
| Nourin-61 | Hypoxia | -12.6↑ | 26.6↓ | 5.4↓ |
| | Salt (100mM NaCl) | 25.3↓ | 23.4↓ | -0.5↑ |
| | Salt (100mM NaCl) + Hypoxia (Simultaneous stress) | 32.6↓ | 26.6↓ | 6.2↓ |
| Chikugo Izumi | Hypoxia | -8.8↑ | 23.5↓ | 10.0↓ |
| | Salt (100mM NaCl) | 35.6↓ | 25.0↓ | 7.4↓ |
| | Salt (100mM NaCl) + Hypoxia (Simultaneous stress) | 43.6↓ | 39.7↓ | 28.7↓ |
| Shirasagi Komugi | Hypoxia | 4.6↓ | 26.5↓ | -2.9↑ |
| | Salt (100mM NaCl) | 23.1↓ | 23.5↓ | -3.7↑ |
| | Salt (100mM NaCl) + Hypoxia (Simultaneous stress) | 45.0↓ | 17.6↓ | 25.2↓ |
| Blue Silver | Hypoxia | 14.9↓ | 4.5↓ | 0.9↓ |

| | | | |
|---|-------|------|-------|
| Salt (100mM NaCl) | 45.6↓ | 2.3↓ | 10.6↓ |
| Salt (100mM NaCl) + Hypoxia (Simultaneous stress) | 53.9↓ | 4.5↓ | 48.9↓ |

Reference – Kamboh MA, Oki Y, Adachi T (2002) The separate or the combined effect of hypoxia and salinity on growth and ionic relations of four wheat varieties. Journal of the Faculty of Environmental Science and Technology, Okayama University 7(1): 91-98.

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: Kamboh et.al. 2002, studied the interaction of hypoxia and salinity in four wheat cultivars Nourin-61, Chikugo Izumi, Shirasagi Komugi, Blue Silver. Plants were subjected to single and simultaneous salt and hypoxia stress treatment. Root length, shoot length, root dry weight, shoot dry weight and chlorophyll content was reduced synergistically under combined stress for all cultivars. **Thus, this stress combination is detrimental to the growth and physiology of wheat cultivars.**