The effect of salt stress on growth parameters of Chrysanthemum

Abdollah Seifi¹, Vahid Abdossi², Elham Danaei¹

¹. Department of Gardening, Garmsar Branch, Islamic Azad University, Garmsar, Iran
². Department of Horticulture, Science and Research Branch, Islamic Azad University, Tehran, Iran

Coresponding author email: Seifiabdollah@yahoo.com

ABSTRACT: Salinity either of soil or of irrigation water causes disturbance in plant growth and nutrient balance and reduces crop yields. The effects of NaCl salinity level and silamol on the growth parameters of chrysanthemum were investigated. Plants were supplied with nutrient solutions containing 50, 100, 150 mM of NaCl and 0, 0.3 and 0.6 mg⁻¹ Si (Silamol). The results showed that stress treatment significantly influenced on growth parameters of chrysanthemum. Application of levels NaCl significantly decreased the chlorophyll content, fresh weight and dry weight, while increased proline content.

Key words: Chrysanthemum, Si (Silamol), Salt stress, NaCl²

INTRODUCTION

Stresses affects the performance of the plant differently in various stages of plant growth. In response to lack of water, plants have different mechanisms to reduce harmful effects of stress. Some of them are morphological such as development of root size and have a widespread root, reduce and change in leaf shape and structure while some of them are physiological such as reduce in pore size and close them, reduce in growth and etc. The type of response to stress condition is related to the stage which stress happen as well as the severity of stress. Salt stress affects different stages of photosynthesis and photo system II (Inze and Montago, 1995). Salinity has an adverse effect on seed germination of several vegetables crops, by creating an osmotic potential outside the seed inhibiting the absorption of water, or by the toxic effect of Na⁺ and Cl⁻ (Khajeh-Hosseini et al., 2003). Water uptake during the imbibition's phase decreases and salinity induces an excessive absorption of toxic ions in the seed (Murillo-Amador et al., 2002). Sivritepe et al., (2003) have reported that NaCl seed priming of melon increases the emergence level and dry weight of plants under saline condition. The significance of soil salinity for agriculture yield is enormous as it affects the establishment, growth and development of plants leading to huge losses in productivity. The objective of this study was to investigate growth and development of chrysanthemum in response to different concentrations of NaCl and Si (Silamol).

MATERIALS AND METHODS

This study was conducted as a factorial experiment based in a randomized complete block design with 12 treatment and 3 replications. The experiment was performed at Pakdasht, Tehran, Iran. Chrysanthemum seeds provided from Pakdasht and planted in pots. Factors were including: four levels 50, 100, 150 and 200 mM of NaCl and 0, 0.3 and 0.6 mg⁻¹ Si (Silamol). Some traits including; fresh weight and dry weight, SOD content, chlorophyll content and proline content were recorded.

Statistical analysis:

All data were analyzed using the SPSS software according to analysis of variance (ANOVA) at P ≤ 0.5 and P ≤ 0.01. Treatment means were compared using Duncan's multiple range test (DMRT) at the 5% level of probability.
RESULTS AND DISCUSSION

Results showed that NaCl treatment significantly affected fresh weight and dry weight (P ≤ 0.01) according to Table 1. Si (Silamol) significantly influenced chrysanthemum fresh weight and dry weight (P ≤ 0.01). Application of levels Si (Silamol) produced the highest fresh weight and dry weight (P ≤ 0.01). The results showed that NaCl treatment significantly influenced leaf area (Table 1). Application of level 0.6 mg⁻¹ Si (Silamol) produced the highest leaf area. Opening percent significantly increased with NaCl treatment (Table 1). Levels different Si (Silamol) treatment showed significant effect on opening percent (P ≤ 0.01). The highest anthocyanin was obtained in level 0.6 mg⁻¹ Si (Silamol). NaCl treatment significantly influenced chlorophyll content (Table 1). Levels CaCl₂ showed significant effect on chlorophyll total content (P ≤ 0.01). The highest chlorophyll content was achieved in level 0.6 mg⁻¹ Si (Silamol). Also, Application of level 0.6 mg⁻¹ Si (Silamol) produced the highest SOD content. Salt is one of the serious abiotic stresses in many countries of the world. Drought stress caused a significant decrease in germination and seedling growth. Shakirova and Sahabutdinove, (2003) Reported that germination percentage decreased under Drought, salinity and temperature stresses. Fresh and Dry weights of shoot and leaf decreased drastically under salinity condition compared with non-salinity condition. These results are similar to those reported by (Kaydan et al., 2007) and (Afzal et al., 2005) who found that dry weight was reduced by salt stress in wheat. During long-term exposure to salinity, plants experience ionic stress, which can lead to premature senescence of adult leaves, and thus a reduction in the photosynthetic area available to support continued growth (Sultana et al., 1999) salt also affects photosynthetic components such as chlorophylls and carotenoids. Changes in these parameters depend on the severity and duration of stress (Mirsa et al., 1997) and on plant species (Dubey et al., 1994). High concentrations of salts also disrupt homeostasis in water potential and ion distribution in plants. Altered water status most likely brings a bout initial growth reduction (Ashraf and O'leary, 1997; Al-Karaka et al., 2000; Dash and Panda, 2001; Demiral et al., 2005). It is also involved in regulating photosynthetic capacity, flowering and senescence, also counteracting adverse effects of salt stress in tomato (Davey et al., 2000). It seems Si increased the tolerance of seeds to stress, therefore it can be concluded that Si application is a simplefast and easy method that could be recommended to farmers for achieving higher germination and uniform emergence under field conditions.

Table 1. Analysis of variances (ANOVA) of measured parameters in chrysanthemum under different treatments of NaCl and Si (Silamol).

<table>
<thead>
<tr>
<th>Source of Variation (S.O.V)</th>
<th>df</th>
<th>Fresh weight</th>
<th>dry weight</th>
<th>Chlorophyll content</th>
<th>Proline content</th>
<th>SOD content</th>
<th>Leaf area</th>
<th>Opening percent</th>
<th>Anthocyanin content</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>11</td>
<td>56.290**</td>
<td>1.836**</td>
<td>93.443**</td>
<td>4.610**</td>
<td>12355.484**</td>
<td>126.169**</td>
<td>14318.182**</td>
<td>0.367**</td>
</tr>
<tr>
<td>Error</td>
<td>-</td>
<td>0.060</td>
<td>0.012</td>
<td>0.110</td>
<td>0.023</td>
<td>0.338</td>
<td>0.075</td>
<td>0.670</td>
<td>0.003</td>
</tr>
<tr>
<td>CV (%)</td>
<td>-</td>
<td>16.56</td>
<td>16.65</td>
<td>17.40</td>
<td>16.47</td>
<td>16.94</td>
<td>16.15</td>
<td>16.75</td>
<td>16.88</td>
</tr>
</tbody>
</table>

** Significant statistically at 1%.

REFERENCES


