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REGULAR ARTICLE

RESPONSE OF ORNAMNETAL ANNUALS TO SALINE WATER IRRIGATION

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ABSTRACT

Availability of fresh water is meager in expansion of gardening in all the countries. In many gardens, farm ponds are utilized for irrigation without analyzing the quality of the water. Alternative sources like ponds can be used for irrigation, but salinity will be a problem. Keeping this in mind an experiment was laid out in completely randomized design with three replications. Salinity was induced by adding NaCl of four different concentrations viz., 0.4, 0.8, 1.2 and 1.6 % and was irrigated on alternative days on two ornamental flowering annuals viz., *Zinnia* and *Petunia*. Twenty days old seedlings were subjected to treatments as per the schedule with a control. Phenological observations viz., plant height, number of branches, number of leaves, earliness in flowering, number of flowers, flower diameter are observed at Initial, 40 and 55 d after sowing. From the results, it was found that plant growth reduced with the elevated NaCl concentration. Saline treated plants had earlier blooming upto 1.2% and with the increased salinity levels, the plants failed to initiate flowering and started withering.

INTRODUCTION

Due to the rapid developments all over the world, the scarcity of fresh water increases for irrigating gardens [1]. On other hand it was noted that the availability of fresh water is meager in expansion of gardening in all the countries. In many gardens, farm ponds are utilized for irrigation without analyzing the quality of the water. If the pond water or any other alternative sources are used for irrigation, salinity is a problem in plant growth and development. Identification and classification of salt tolerant landscape species may solve the issue partially [2]. Generally, groundwater or shallow aquifer saline water may be available for using in irrigation [3, 4]. The range of salt stress vary with different geographical regions and soil conditions [5, 6]. Keeping this in mind an experiment was laid out to determine the salinity stress on growth and flowering of certain ornamental flowering annuals and also to find out the susceptibility nature of the annuals under different salinity levels.

MATERIALS AND METHODS

Pot culture experiments were carried out in the department of Horticulture, Faculty of Agriculture during 2017 to find the saline tolerant flowering annuals. The experiment was laid out in completely randomized design with three replications. Salinity was induced by adding NaCl of four different concentrations viz., 0.4, 0.8, 1.2 and 1.6 % and was irrigated thrice during 30,40 and 50 d after sowing on two ornamental flowering annuals viz., *Zinnia and Petunia*. Fifteen days old seedlings were subjected to treatments as per the schedule with a control. Phenological observations viz., plant height, number of branches, number of leaves, earliness in flowering and number of flowers are observed initially and at 40 and 55 d after sowing respectively.

RESULTS AND DISCUSSION

The data observed during the experiment are presented in table 1. It was observed that the salinity levels inhibit the plant height in both the plants. The relative percentage of growth rate in observed plants was within 93.5 to 94.8 % and 92.9 to 84.5 % in zinnia and petunia respectively. Salinity decreased growth in plants. The growth rate of the slowest growing plant is lowest height was observed in the higher doses (T5,T6) with highest concentration of NaCl ie. 18.2 in Zinnia and 22.3 in Petunia which was 94.8 % and 84.5 % over control. These results were in consonance with the findings of Ivanova [7].

The data on number of branches showed also showed marked differences among the treatments. From the table 2, it was revealed that the number of branches decreased with the increase in NaCl concentration. The growth rate was reduced from 85.9 to 83.3 % in Zinnia and 78.1 to 77.0 % in Petunia in 30 and 45 DAS respectively. These results are in agreement with previous works [8,9]. Considering the number of leaves of zinnia and petunia (Table3), maximum numbers of leaves (49.8) were found in T1 control and with increase in concentration of NaCl, (T6) the lowest growth rate of 23.2 and 49.8 leaves in zinnia and petunia with 73.9 % and 78.9 % over control. Increased in salt stress concentration of irrigation water reduces plant size, branches and leaves due to an

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inhibition in cell elongation and cell division [10-12].

The data pertaining to the flowering characters also showed similar results with the addition of saline water irrigation (table 4). Earliness in flowering (21.2 d and 18.5 d) under both T3 and T4 treatments of zinnia and petunia respectively, whereas the control (T1) plants took 29.2 d and 20.8 d. It was observed that those plants received higher dosage of saline water doesn't produce any flower and starts withering. Similarly, maximum number of flowers (4.1 and 3.4) was noticed in control T1 in zinnia and petunia respectively. However, under increased salinity levels, ie. upto 1.2 % Nacl, both the annuals produced minimum numbers and upon the increased levels beyond 1.2 % doesn't produce any flowers. The findings of Munns [12] and Tester and Davenport [13] supported the present results.

From the experiment, it was found that Zinnia and Petunia are having the tolerance mechanism to salinity levels upto 1.2 % NaCl when it is grown as ornamental flowering annuals.

Table 1: Effect of salinity levels on plant height of Zinnia and Petunia

Treatment details	Plant height (cm) of Zinnia							Plant height (cm) of Petunia						
	Initial	40 DAS		55 DAS		Total growth rate		Initial	40 DAS		55 DAS		Total growth rate	
	Cm	Cm	%	Cm	%	Cm	%	Cm	Cm	%	Cm	%	Cm	%
T1–control	19.2	29.3	100	38.4	100	19.2	100	22.1	40.3	100	48.5	100	26.4	100
T2–Plants treated with Nacl 0.4%	19.1	28.4	96.9	37.8	98.4	18.2	94.8	22.8	39.2	97.3	48.4	99.7	25.6	96.9
T3–Plants treated with Nacl 0.8%	18.8	27.9	95.2	37.8	97.1	19.0	98.9	21.9	38.8	96.3	46.2	95.3	24.3	92.0
T4–Plants treated with Nacl 1.2 %	17.9	25.4	86.6	36.5	95.1	18.6	96.9	22.3	38.7	96.0	46.1	95.0	23.8	90.1
T5–Plants treated with Nacl 1.6%	18.3	25.8	84.6	36.5	95.1	18.2	94.8	22.4	38.2	94.8	40.3	93.4	22.69	86.9
T6–Plants treated with Nacl 2.0%	15.2	24.2	83.3	35.9	93.5	17.6	97.9	21.8	32.1	93.5	40.1	92.9	22.3	80.2

Table 2: Effect of salinity levels on number of branches in Zinnia and Petunia

Treatment details	Number of branches in Zinnia							Number of branches in Petunia						
	Initial	40 DAS		55 DAS		Total growth rate		Initial	40 DAS		55 DAS		Total growth rate	
	Cm	Cm	%	Cm	%	Cm	%	Cm	Cm	%	Cm	%	Cm	%
T1–control	4.2	7.1	100	7.2	100	3.0	100	5.1	7.3	100	7.4	100	2.3	100
T2–Plants treated with Nacl 0.4%	5.1	6.9	97.2	6.8	94.4	1.7	56.7	5.3	6.8	93.2	6.9	93.2	1.6	69.6
T3–Plants treated with Nacl 0.8%	5.8	6.7	94.4	6.7	93.1	0.9	30.0	5.2	6.6	90.4	6.6	89.2	1.4	60.9
T4–Plants treated with Nacl 1.2 %	5.4	6.2	87.3	6.4	88.9	1.0	33.3	5.0	6.1	83.6	6.0	81.1	1.0	43.5
T5–Plants treated with Nacl 1.6%	5.3	6.0	85.9	6.0	83.3	0.7	23.3	5.1	5.7	78.1	5.7	77.0	0.8	26.1
T6–Plants treated with Nacl 2.0%	5.4	5.8	80.7	6.0	83.3	0.7	23.3	5.1	5.5	78.1	5.5	77.0	0.8	26.1

Table 3: Effect of salinity levels on number of leaves in Zinnia and Petunia

Treatment details	Number of leaves in Zinnia							Number of leaves in Petunia						
	Initial	40 DAS		55 DAS		Total growth rate		Initial	40 DAS		55 DAS		Total Growth Rate	
	Cm	Cm	%	Cm	%	Cm	%	Cm	Cm	%	Cm	%	Cm	%
T1–control	18.4	32.5	100	49.8	100	31.4	100	31.2	42.9	100	55.4	100	24.2	100
T2–Plants treated with Nacl 0.4%	18.8	30.2	92.9	48.2	96.8	29.4	93.6	30.8	40.8	95.1	53.8	97.1	23.0	95.1
T3–Plants treated with Nacl 0.8%	18.6	29.5	90.8	43.1	86.5	24.5	78.0	32.4	39.1	91.1	51.7	93.3	19.3	79.8
T4–Plants treated with Nacl 1.2 %	17.9	28.6	88.0	41.4	83.1	23.5	74.8	31.8	37.6	87.6	51.0	92.1	19.2	79.3
T5–Plants treated with Nacl 1.6%	18.0	27.1	83.4	41.2	82.7	23.2	73.9	30.7	36.2	84.4	38.8	89.9	19.1	78.9
T6–Plants treated with Nacl 2.0%	17.9	26.9	83.2	40.9	82.6	22.9	73.8	30.5	35.9	83.9	38.5	89.9	19.1	78.9

Table 4: Effect of salinity levels on earliness in flowering and number of flowers in Zinnia and Petunia

Treatment details	Earliness in flowering		Number of flowers per plant	
	Zinnia	Petunia	Zinnia	Petunia
T1–control	29.2	20.8	4.1	3.4
T2–Plants treated with Nacl 0.4%	29.0	19.9	3.3	2.3
T3–Plants treated with Nacl 0.8%	21.2	18.5	3.1	1.0
T4–Plants treated with Nacl 1.2 %	21.2	18.4	2.8	1.1
T5–Plants treated with Nacl 1.6%	-	-	-	-
T6–Plants treated with Nacl 2.0%	-	-	-	-
	ns	ns	ns	ns

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