IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Assessment of the relative level of tolerance to saline conditions in tomato variety.

Sandeep Saini*,Mousmi Syed*
* Department of Agricultural Science, Shridhar University, Pilani

Abstract

A pot experiment was conducted to find out the effects of salinity on morphological, yield and yield attributes of tomato germplasm. The experiment was carried out at the Research Farm, Department of Agricultural Science, Shridhar University, Pilani (Rajasthan) during the period from Nov, 2021 to March 2022. The experiment consisted of five salinity levels. The results showed that the performance of Pusa Rohini was comparatively better in all cases. The yield of tomato varieties was declined significantly with the increasing salinity level condition. The yield per plant of Pusa Rohini was 211.0g when treated with the highest level of salinity i.e., 100mM and the yield of N2535 was 93.67g which was the lowest yield among the varieties with the highest level of salinity condition. So, from the results it can be concluded that Pusa Rohini is comparatively salt tolerant than the other varieties. The experiment was conducted in pots using salinity levels of 0,25, 50, 75 and 100 mM. However, further studies can be conducted at field or pot condition with more tomato varieties using more salt concentrations to identify any suitable varieties to cultivate under the saline prone areas of Rajasthan.

Key words: Tomato, germplasm, salinity level, salt tolerant

Introduction

Tomato *(Lycopersicon esculentum Mill.)* is considered as one of the most important, popular and nutritious vegetables in India. Tomato is normally self-pollinated annual crop which belongs to the family Solanaceae with chromosome number 2n=24 (Jenkins, 1948). Tomato is an annual herbaceous plant. Cultivated tomatoes are classified as moderately sensitive to salinity. Mining for salt tolerance potential in tomato wild relative species started in 1941 by Lyon. Tomato can be grown any types of soil. Sandy land and loamy soil with adequate supply of organic matter, good moisture holding and drainage capacity are ideal for tomato cultivation. Optimum temperature for seed germination, vegetative growth and reproductive growth is 20^0c, 25^0c, 18-22^0c temperature, respectively. Tomato requires high light intensity. Optimum RH is 60-70%, 9-11 hours day length is required for flowering. Salinity constitutes the most agricultural problem in many parts of the world (Ramage, 1980). Production of tomato depends on many factors, such as quality of seed, plant spacing, planting time, manure, fertilizer, salinity, pruning and management practices etc.

Salinity is one of the major environmental stresses affecting plant growth and development (Ashraf and Wahed, 1993). Over four-fifth of the surface of our planet is covered with salt, among many other constituents approximately 0.5 M NaCl. Still only very few groups of higher plants can withstand such conditions. Most terrestrials species are unable to tolerate even one-tenth of the salt concentration of ocean water without a serious setback in their water and nutrient balance or in their metabolism (Waisel, 1972). The salinity

damage manifests most prominently in the dry season when concentration of salts at the soil surface is caused by evaporation that ultimately causes a drastic reduction in crop yield. Agricultural land use in saline areas is very poor, which is much lower than the countries average cropping intensity (190 percent). For these reasons, plant response to salinity is one of the most widely researched subjects in plant physiology. The response to salinity is generally evaluated by using plant growth, ion balance and osmotic adjustment. A number of researchers (Sancheg-Blanco *et al.,* 1991; Alarcon *et al.,* 1993 and 1994) have studied the water relation and the osmotic and elastic adjustment capacity of different tomato genotypes under saline stress and showed that the growth of salt treated tomato plants is often limited by the inability of the root to extract water from soil and transport to shoot. Salinity affects plant growth by decreasing the rate of water uptake due to osmotic effect, through ion-specific toxic effects caused by ion antagonism (Levitt, 1980). In saline areas, yield of tomato decreases with increasing salinity level. The production technology of a crop is a complex process and in saline areas it becomes more complex. Agronomical practices like irrigation, drainage, mulching etc. are expensive involvement. So the poor farmer cannot bear this expense and especially our coastal belt's vegetable grower did not take advantage by this tomato farming as expected. Through this research work attempt had been taken to know the considerable level of salinity for production of tomato by evaluating the performances of the four varieties namely Abhinav, N2535, Pusa Rohini, TO1389.

Materials and Methods

The experiment consisted of two factors and carried out to study the field performance of four tomato germplasm under different salinity level. The following treatments were included in the experiment:

Factor (A): Variety

i. V_1: Abhinav
ii. V_2: N2535
iii. V_3: Pusa Rohini
iv. V_4: TO1389

Factor (B): Salinity level

i. T_0 : Control (no salt,)
ii. T_1 : 25 mM
iii. T_2 : 50 mM
iv. T_3 : 75 mM
v. T_4 : 100 mM

The two-factor experiment was laid out in the randomized complete block design with three replications. The entire experimental plot was divided into three blocks each containing 20 plastic pots. In total, there were 60 plastic pots in the experiment and each pot contained one plant. The diameter of each pot was 45 cm at top and 32 cm at the bottom. The depth of soil of each pot was 15 cm. The data in respect of growth, yield contributing characters and yield were statistically analysed to find out the statistical significance of the experimental results. The means for all the treatments were calculated and the analyses of variance for all the characters were performed by F test. The significance of

difference between the pairs of means was separated by LSD test at 5% and 1% levels of probability (Gomez and Gomez, 1984).

Results and Discussion

The effect of different salinity level on some morphological, yield and yield contributing parameters of tomato genotypes. Plant height, number of leaves, stem diameter, number of primary branches, days to first flowering, flowering duration, number of flower clusters per plant, number of total flowers per plant, number of dropped flowers per plant, fruit length, fruit breath, number of fruits per plant, individual fruit weight and fruit yield per plant were decreased with increasing salinity level. Variety had significant influence on growth and yield parameters of tomato varieties. At 34 DAT the maximum number of leaves (15.27), stem diameter (0.62 cm) and number of primary branches per plant (3.72) were recorded in the variety Pusa Rohini and maximum plant height (43.20 cm) was observed in the variety Abhinav while the minimum number of leaves (10.53), stem diameter (0.51 cm), number of primary branches per plant (3.21) and plant height (23.40 cm) were recorded from the variety N2535.

Variety also had highly significant influence on number of flower cluster per plant, number of total flowers per plant, fruit length and fruit breadth. The maximum number of flower clusters per plant (5.50), number of total flowers per plant (21.07), maximum fruit length (4.71 cm) and maximum fruit breadth (2.61cm), were obtained from the variety Pusa Rohini while the minimum 3.07, 12.13, 3.03 cm and 2.61 cm were recorded from the variety N2535, respectively.

Number of fruits per plant, individual fruit weight and fruit yield per plant were significantly influenced at high salinity level. The maximum number of fruits per plant (9.50), individual fruit weight (70.27g) and fruit yield per plant (361.27g) were recorded in the variety Rohini while the minimum from the variety N2535.

Salt concentration had high significant influence on plant height, number of leaves, stem diameter, number of primary branches per plant of tomato varieties. The maximum plant height (34.42 cm), number of leaves (16.83,) stem diameter (0.57 cm) and number of primary branches per plant (3.82) were obtained from the treatment with lower

level of salinity water i.e. 25 mM and while the minimum were 27.50 cm, 10.67, 0.53 cm, and 2.26 and respectively when treated with highest level of salinity water i.e. 100 mM at maximum vegetative growth stage 34 DAT.

Main Effect of variety on days to first flowering, flowering duration, number of flower cluster per plant, number of total flower per plant and number of dropped flowers per plant

Variety	Days to first flowering	Flowering duration (days)	No. of flower clusters plant^{-1}		No of total flowers plant^{-1}		No. of dropped flowers plant^{-1}
			48 DAT	48 DAT	41 DAT	48 DAT	
Abhinav	20.87	42.41	2.80	3.60	11.20	14.40	10.89
N2535	25.17	50.94	1.47	3.07	5.87	12.13	9.83
Pusa Rohini	23.76	48.73	3.13	5.50	12.67	21.07	8.30
TO1389	23.71	48.48	2.93	4.83	11.73	19.07	9.82
$LSD_{0.05}$	0.30	0.49	0.37	0.45	1.15	1.05	0.26
$LSD_{0.01}$	0.41	0.66	0.50	0.60	1.54	1.40	0.35
Level of significance	**	**	**	**	**	**	**

** = Significant at 1% level of probability, LSD = Least significant difference

Main effect of salinity level on yield contributing characters

Salt concentration (mM)	Fruit length (cm)	Fruit breadth (cm)	No. of fruits per plant		Individual fruit wt. (g)
			41 DAT	48 DAT	
Control	3.92	3.38	6.88	9.75	44.08
25	4.10	4.04	8.00	10.50	46.17
50	3.98	3.79	7.13	10.25	45.75
75	3.55	3.33	6.64	7.50	35.00
100	3.25	3.13	6.50	7.38	33.50
$LSD_{0.05}$	0.10	0.08	0.60	1.20	4.77
$LSD_{0.01}$	0.14	0.11	0.80	1.60	6.37
Level of significance	**	**	**	**	**

** = Significant at 1% level of probability LSD = Least significant difference, DAT= Days After Transplanting

Number of flower clusters per plant, number of total flowers per plant, fruit length and fruit breadth were influenced by salt concentration at a highly significant level. The maximum number of flower clusters per plant, number of total flowers per plant, fruit length and fruit breadth 4.71, 19.67, 4.10 cm, 4.04 cm were obtained from low level of salinity i.e. 25 mM and these attributes were largely consistent with those 4.33, 18.33, 3.98 cm, 3.79 cm respectively

were obtained from 50 mM level of salinity, while the minimum were obtained from the highest level of salinity treatment i.e. 100 mM and those were 3.96, 13.83, 3.25 cm and 3.13 cm.

Salt concentration highly influenced the number of fruits per plant, individual fruit weight and fruit yield per plant. The maximum number of fruits per plant (10.50), individual fruit weight (46.17 g) and fruit yield per plant (405.33 g) were obtained from the lowest level of salinity (25 mM) treatment and those were largely compatible with 10.25, 45.75 g, 357.42 g treated in 50 mM level of saline water. While the minimum were 6.50, 33.50 g and 144.25 g obtained from highest level of salinity (100 mM).

Conclusion

In a pot trial, four varieties of tomato were evaluated against five salinity level conditions. The yield was varied significantly with the varieties and salinity levels. The experiment was conducted in pots using salinity levels of 0, 25, 50, 75, and 100 mM. However, further studies can be conducted at field or pot condition with more tomato varieties using more salt concentrations to identify any suitable varieties to cultivate under the saline prone areas.

Reference

Ashraf M, Wahed A 1993: Response of some genetically divers lines of chickpea to salt. *Australian Journal Plant Physiology* **154** 257-266.

Gomez KA, Gomez AA 1984: *Statistical Procedures for Agricultural Research* (2nd Edition) John Willey and Sons. New York. pp. 207-215.

Jenkins, J. A. 1948. The origin of cultivated tomato. *Economic Botany* **2** 379

Levitt J 1980: *Salt Stress.* In: Responses of plant to environmental stress. Vol. II. Academic Press, New York. pp. 365-454.

Ramage RT 1980: *Genetic methods to breed salt tolerance in plants*. In genetic Engineering of Osmoregulation: Impact on plant productivity for Food, Chemicals and Energy, New York. Plenum Press. pp. 311-318.

Sanchez-Blanco MJ, Bolarin MC, Alarcoon JJ, Torrecillas A 1991. Salinity effects on water relations in *Lycopersicon esculentum* and its wild salt-tolerant relatives species. *L. pennellii. Phisilogia pantarurn* **43** 269-274.

Waisel Y 1972: *Biology of Halophytes*. Academic Press, New York. pp. 1-41.