



# Breeding for Salt Tolerance in Tomato (*Solanum lycopersicum* L.)

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## Introduction

- Salinity is a major abiotic stress affecting plant growth and productivity during all developmental stages.
- About 400 million ha land have damaged by salt for crop cultivation and 30% land will be lost within the next 25 years and up to 50% by 2050..
- In Bangladesh over 30% of net cultivable area lies in coastal region. Crop production is rapidly declining on that area due to lack of salt tolerant varieties.
- In 1973 the salt affected area in the coastal region was 7,50,780 ha, which is increased 9,50,780 ha in 2009

## Materials and Methods

Genes are required for design of stress resistant crop cultivar depends on ideotype.

Selection of parental material

Selection of superior genotype from segregating generation

Almost all the conventional breeding methods have been followed for the development of the salt tolerant genotypes i.e introduction, selection, hybridization, mutation .

Worldwide, the research to overcome salt related problems is based on two approaches-

Change the growing environment (make it normal) suitable for the normal growth of plants.

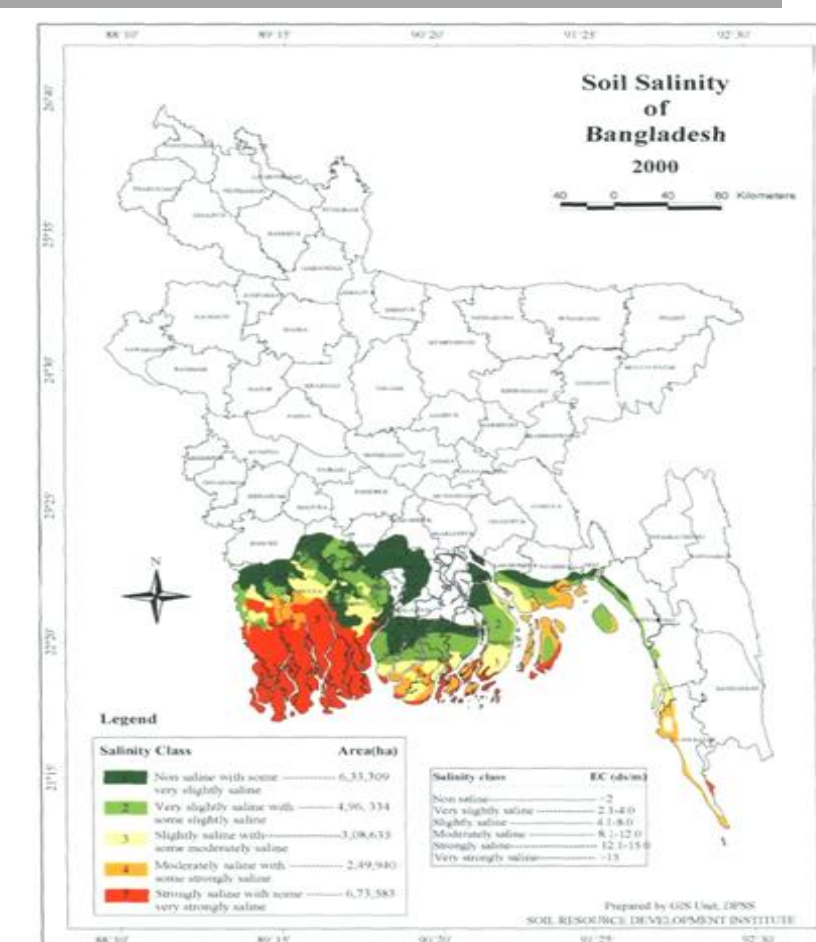
Select the crop and/or change genetic architecture of the plant so that it could be grown in such salt affected areas.

## Summary Discussion

Major Causes of Soil salinity:

- Low precipitation
- High surface evaporation
- Weathering of native rocks
- Irrigation with saline water
- Poor cultural practices

- 1 Restricting the entry of toxic ions at root level - Exclusion
- 2 Transporting the toxic ions to stem, leaf sheath or older leaves - plant level compartmentation
- 3 Excretion of salt through salt glands, salt-hairs or bladders - in most halophytes
- 4 Sequestration of the toxic ions to vacuole or cell wall - cell level compartmentation



- Fig.: Mechanism for salt tolerance in Plant,
- Fig: Salt affected area in Bangladesh.

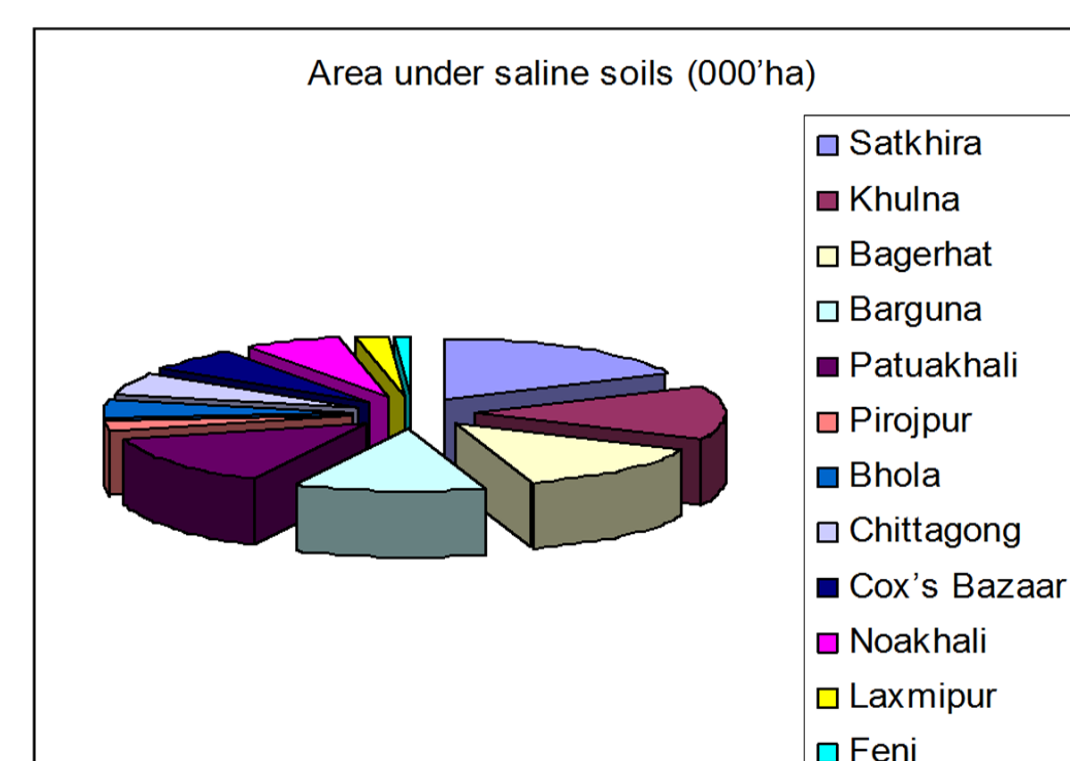
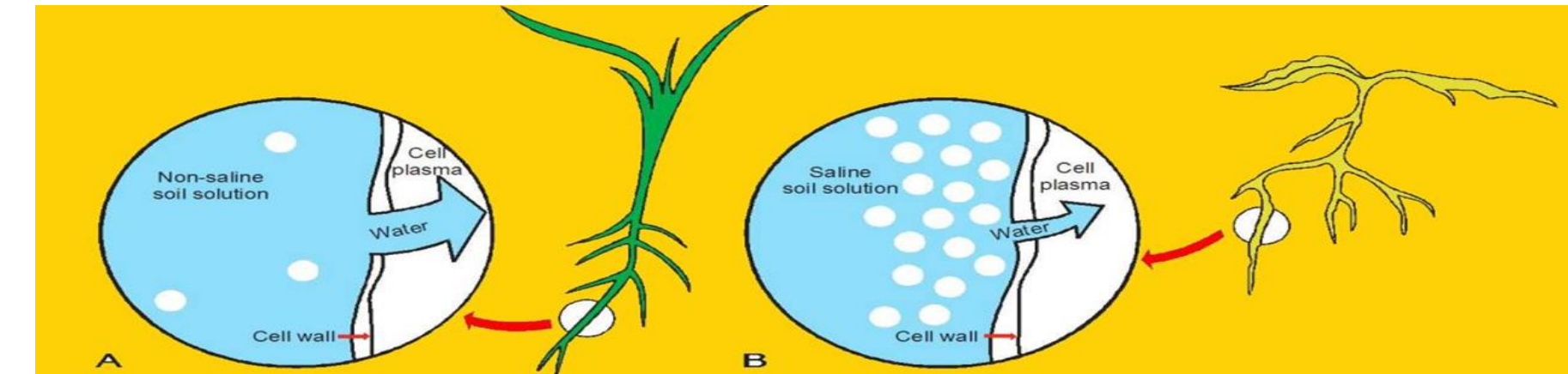


Fig: Tomato plant subjected to salinity stress.  
A. Control, B. salt affected



### Characteristics of Ideal High Yielding Salinity Tolerant Variety

Highly tissue tolerance

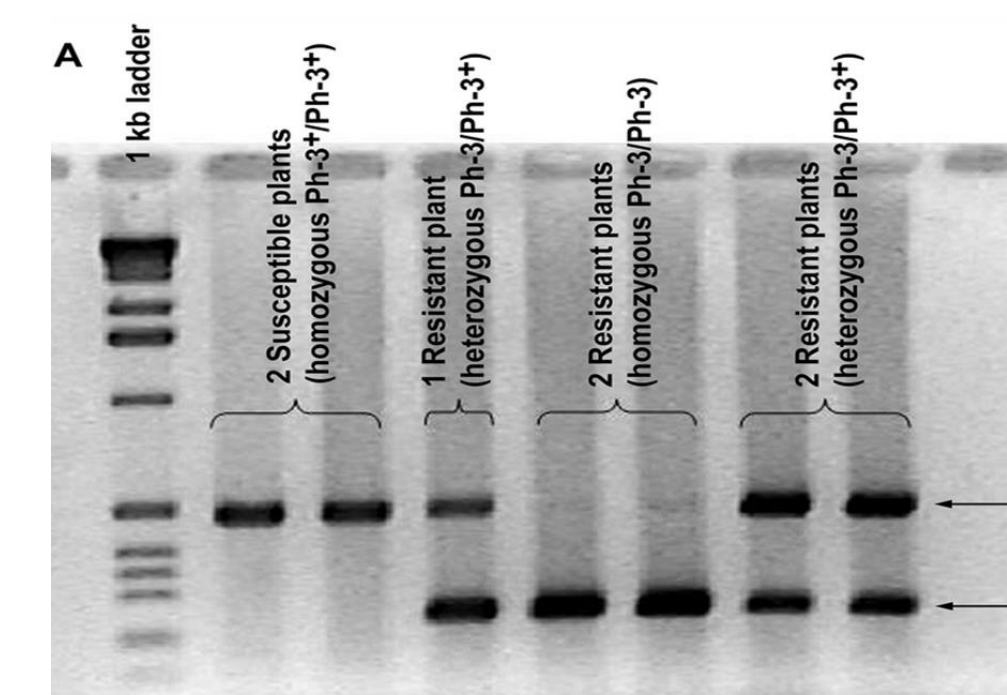
Minimum per day uptake of Na<sup>+</sup>

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High uptake of K<sup>+</sup> per day, and Low Cl<sup>-</sup> uptake



Marker linked to the allele Ph-3\* (Susceptibility) (size 432 bp)  
Marker linked to the allele Ph-3 (Resistance) (size 249 bp)



Fig. Salt tolerance of wild-type tomato plants and trans-genic plants over expressing

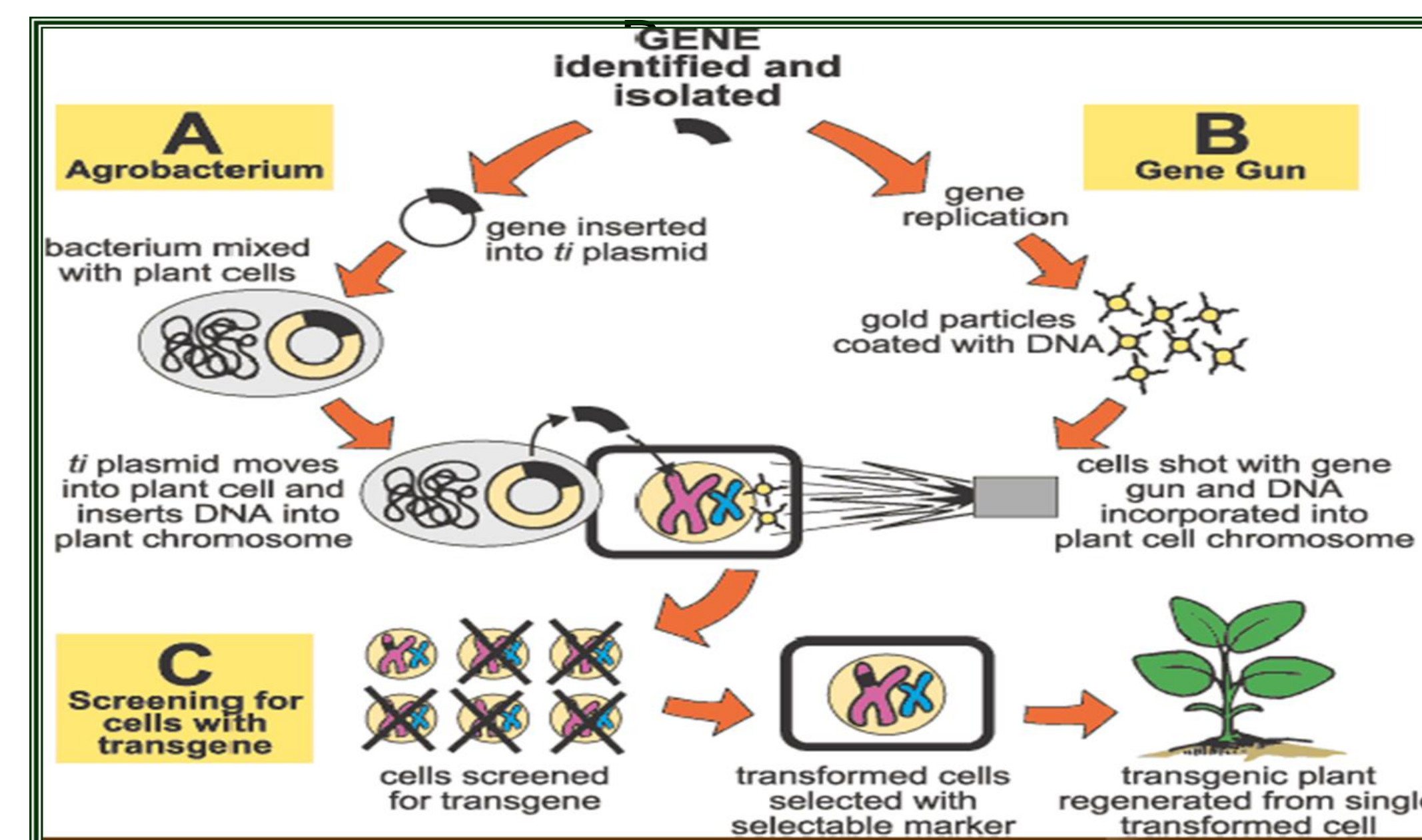


Fig.: Gene Transformation in Plant

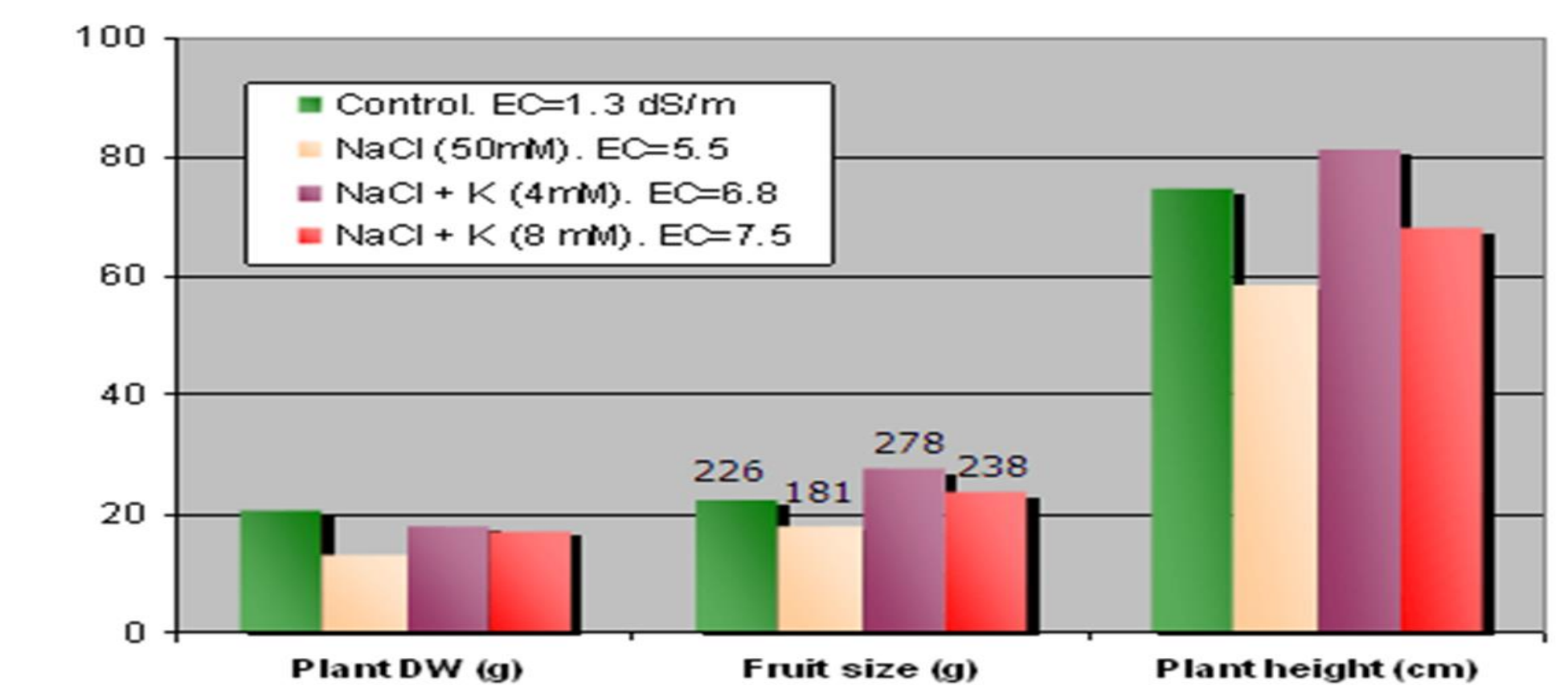


Fig: The effect of salinity and NaCl+K potassium nitrate on vegetative parameters and fruit size in tomatoes.

## Conclusions

- Breeding methods can be effectively used for evaluation and selection of new genotypes for salt tolerance.
- Different breeding techniques have been used for identification of novel genes imparting tolerance to various stresses.
- Breeding approaches for stress tolerance allow exploitation of variability from wide crosses.
- Studies on development of transgenic tomato for abiotic stresses tolerance have shown promising results.

## Future Directions

The present demand for tomato will be 25% higher than that of the present production level. To meet-up this demand should taken the following strategies-

Development of varieties for salt affected area

Replacement of the present varieties by superior inbred, hybrid and super high yielding varieties.

Collaboration between the national and international research organization should be developed.

Government program should be taken .

More breeding program should be taken incorporating with genetic engineering.

## Acknowledgments

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