SCREENING OF YIELD CONTRIBUTING TRAITS OF CHILLI (*Capsicum* sp.) GENOTYPES AGAINST SALINITY

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CERTIFICATE

This is to certify that thesis entitled, ***"SCREENING OF YIELD CONTRIBUTING TRAITS OF CHILLI (Capsicum sp) GENOTYPES AGAINST SALINITY"*** *submitted to the faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of* ***MASTER OF SCIENCE IN GENETICS AND PLANT BREEDING****, embodies the result of a piece of bona fide research work carried out by* ***MD. ABU IBNE ANAS SAMIM****, Registration* ***No. 13-09244*** *under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that such help or source of information, as has been availed of during the course of this investigation has been duly been acknowledged

Dated: December, 2020

Place: Dhaka, Bangladesh

Prof. Dr. Naheed Zeba

Supervisor

DEDICATED

TO

MY BELOVED PARENTS

SOME COMMONLY USED ABBREVIATION

Full Word	Abbreviation	Full Word	Abbreviation
Ammonium Nitrate	NH4NO3	Horticulture	Hort
Amonium ion	NH4+	International	Intl
Agriculture	Agric	Journal	J.
Applied	App.	Killo gram	Kg
Analysis of Variance	ANOVA	Least singnificant difference	LSD
Botany	Bot.	Leaf Area	LA
Biology	Biol	Membrane Stability Index	MSI
Bangladesh Bureau of Statistics	BBS	Micro molar	umol
Bangladesh Agricultural Research Institute	BARI	Meter	m
Calcium Ion	Ca2+	Milli gram	mg
Carbon Dioxide	CO2	Mili molar	mmol
Chloride ion	Cl-	Millimeter	mm
Completely Randomized Design	CRD	Nitric Acid	HNO3
Centimeter	cm	Perchloric Acid	HClO4
Days transplanting after	DAT	Plant Genetic Resource Center Center	PGRC
Decisimens per meter	DS/m	Physiology	Physio
Experimental	Exp	Physiology	Physio
Environment	Env	Potassium Ion	K+
Electrical Conductivity	EC	Relative Water Content	WRC
Farmyard Manure	FYM	Sher-e-Bangla agricultural University	SAU
Food and Agriculture Organization	FAO	Ultra Violet Ray	UV
Gram	g	Sodium Hydroxide	NaOH

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SCREENING OF YIELD CONTRIBUTING TRAITS OF CHILLI (*Capsicum* sp.) GENOTYPES AGAINST SALINITY

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ABSTRACT

Salinity stress is one of the major threat of agricultural production. A pot experiment was conveyed at the experimental net house of the Department of Genetics and Plant Breeding Sher-e Bangla Agricultural University, Dhaka from November to April, 2019 to investigate the effect of Salinity stress on the growth, physiology and yield and the mollification capacity of Salinity in Chilli on different genotypes. The genotypes were DEB 1302 (G_1), Bogra Zhal Morich, (G_2), Bogra Special Morich (G_3), Black Lady (G_4), CO 525 G59 SRC04 (G_6), SRC07 (G_7), SRC03 (G_8), SRC06 (G_9) and SRC10 (G_{10}) Three salinity treatments viz. T_1 (control), T_2 (4 dS/m, mild salinity), T_3 (8 dS/m, moderate salinity), The genotypes were collected from genetics and plant breeding department and treatments were T_1 (control), T_2 (4 dS/m, T_3 (8dS/m). Completely Randomized Design (CRD) with three replications was followed in both experiments Salinity treatment affected almost all traits of chilli negatively except days to first flowering, first fruit setting, relative water content and chlorophyll content. Early flowering (38.00 DAT) was found in G_9 and early fruit setting (51.55 DAT) was found in G6 at moderate and severe salinity respectively. Phenotypic variance was higher than the genotypic variance for all the characters under all the treatments. Phenotypic co-efficient of variation and genotypic co-efficient of variation was high in all the characters except number of branches per plant under T_2 treatment and fruits diameter (mm) under T_2 and T_3 treatments. High heritability coupled with high genetic advance and genetic advance in percentage of mean was found in days to first flowering, days to first fruit setting, root length, number of leaves per plant under all the treatments indicated that this characters are controlled by the additive gene action and direct selection may be effective through this characters.

From the research findings of salinity experiment, the following could be recommended G_9 could be suggested for early flowering and fruit setting for mild to moderate saline prone area G_7 could be suggested for maximum leaf area, number of branches per plant, fruit diameter at mild to moderate saline prone area G_6 could be suggested for yield per plant, number of fruit per plant and maximum number of leaves per plant higher for mild to moderate saline prone area.

CHAPTER I
INTRODUCTION

Chilli (*Capsicum* spp.) is one of the most significant crop both as a vegetable and spice valued for its scent, taste, smell and pungency (Vikram *et al*., 2014). Chilli, under the genus of Capsicum, has quite 25 commonly used species with four catagories of cultivars as Chinense catagories (West Indies chilli), Frutescens catagories (bird chilli), Annuum catagories (hot chilli) and sweet pepper catagories (Nsabiyera *et al*., 2013). Everywhere the world chili is usually consumed either in fresh, dried or in powder (El-Ghoraba *et al.*, 2013).

Chilli is one among of the foremost important ingredients which plays significant role for the diet of individual of South and South-east Asia every day. The Capsicums are originited from the tropical areas of Central America and the west Indies, but it quickly spread throughout the tropical world after the discovery of America and west Indies. Chilli has high demand among the consumers due to its diversified uses.

The ingredient of chilli are important for its nutritional value, flavor, texture, color and it is also an important source of oleoresin which has widely uses in process food, industries and in pharmaceuticals (Osuna-Garcia *et al*., 1998). Chilli is rich in aminoacid, lipids, carbohydrates, fibres, mineral salts (Ca, P, Fe) and also rich in several vitamins, such as vitamin (A, D3, E, C, K, B2 and B12) (El-Ghoraba *et al*., 2013). The fruits are a crucial source of health-related phytochemical compounds, such as ascorbic acid, carotenoids, tocopherols (vitamin E), flavonoids, and capsaicinoids which are very esential for preventing different chronic diseases such as cancer, asthma, coughs, sore throats, diabetes (Wahyuni *et al*., 2013). The pharmaceutical application of capsaicinoid is attributed to its antioxidant, anticancer, antiarthritic, and analgesic properties (Akbar *et al*., 2010).

Worldwide it is cultivated over 1.4 million ha with a production of 18.8 million tonnes (Narolia *et al*., 2012). Generally, chilli is grown as a cash crop in Bangladesh. Its commercial production is largely concentrated in Bogura, Rangpur, Comilla, Noakhali, Faridpur, Chittagong and Mymensingh district (Munshi *et al*., 2000). In Bangladesh about 94 thousand hectares of land under chilli cultivation and the total production is

approximately 123 thousand metric tons (BBS, 2015). Thus, the average yield of chilli is about 2121.80 kg per hectare which is very low compare to others country of the world.

Bangladesh is one among the foremost climate vulnerable country with in the world that includes salinity, storms, drought, irregular rainfall, high temperature, flash floods. Salinity is one of the main abiotic stress that affecting crop productivity and diminished significant crop loss globally. It impedes plant performance by inducing hamful effects on germination and plant vigor. Moreover, 6% of total land area and 30% in irrigated lands are suffering from salinity (Fahad *et al.,* 2014).

In Bangladesh, there are approximately 2.85 million ha of coastal land of which about one million ha are remarkably suffering from varying degrees of salinity (Haque *et al*., 2014). Investigation which endeavored at the effect of salt stress on growth transpired that there has been an outright connection between the decrease in plant length and the increase in the concentration of NaCl (Carpici *et al*., 2009). About 30-50% of net cropped areas with in the coastal region of Bangladesh remains fallow in Rabi season, mainly due to the reason of salinity.

The predominant salinity intrusion due to global climate change has been dreadfully affecting the crop productivity with in the saline regions of Bangladesh (Rahman *et al*., 2000). This example demands an expeditious response to elevate the crop productivity.

The salinity attack plants in many ways, like the initial impact of salinity for plants is an osmotic effect through which plants lose their internal water balance from their cells (Ahn TI & Son JE, 2011). The second hazard of salinity is an ionic effect, where plants face problems of ionic toxicity, especially toxicity of Na+ and Cl- ions (Ali *et al*., 2007).

The third negative impact of salinity for plants is that the nutrient imbalance, where plants uptake toxic elements like Na+ instead of nutrient elements particularly K+ (Baiyeri KP & Mbah BN 2006). Plants use several mechanisms to adopt these influences of salinity. Generally, plants synthesize organic acids (proline, glycine- betane, etc) as osmo-protectant the Seed germination is that the most susceptible to salt stress in comparision with other growth stages of plants (Bein *et al*., 2014).

Under salinity stress increased level of reactive oxygen species (ROS) in cells causes K+ efflux from the cells. Increased ROS concentrations weakens the defense reaction which result in oxidative stress. ROS are very destructive to plants at higher concentrations. Under

salinity stress ROS increases and may pose a threat to plant cells by causing lipids peroxidation, proteins oxidation, impairment of nucleic acids, inhibit activation of enzymes, activates programmed necrobiosis and ultimately resulting the death of the cells (Sharma *et al*., 2012).

To overcome the negative effect of salinity chilli plants develop some mechanism by altering its morphological, physiological and other traits. Changes of morphological, physiological and nutritional traits of chilli due to the genotypes- stress interaction as an indicator of stress tolerant mechanisms, Plant Breeders have experimented to develop stress tolerant variety. There are no worth mentioning salinity tolerant chilli variety in our country. Thus due to unavailability of stress tolerant chilli variety, the southern coastal region remains uncultivated. Farmers during this area cannot change their financial condition. As chilli is one among the foremost important cash crop and may be cultivated under some lower extent of salinity it is time demanding to develop medium to high level of salinity tolerant variety. This study was conducted to research the agromorphogenic, physiological and nutritional traits to identify and salt stress tolerant chilli genotype. With envision of the above point of views, the present research work has been undertaken so as to release the subsequent objectives

I. To observe the growth and yield of chilli genotypes under different salinity condition
II. To determine the response of genotype × treatment interaction based on yield contributing characters and nutritional traits
III. To identify salinity tolerant genotype of chilli

CHAPTER II
REVIEW OF LITERATURE

Chilli (Capsicum frutescens) is an economically important solanaceous crop cultivated in Bangladesh. Very few research works have been done for the improvement of this crop in Bangladesh and other countries of the world. Salinity stress are the main abiotic stress among them that limit the crop production (Forster, 2004).

Sustainable and equitable global food security is partly dependent on the development of crops and horticultural plants with increased salt tolerance. Increased salt tolerance of perennial species used for fodder or fuel production is also a key component in reducing the spread of secondary salinity in many regions in the world. In the last few years, considerable progress has been made in the analysis of the transcript to study salt stress either alone or in combination with other abiotic stresses. The present review summarizes current research findings on chilli plant with related examples are discussed in this chapter.

2.1 Chilli

The chilli the fruit of plants from the genus capsicum which are the member of solanaceae family (Purseglove 1968), chilli peppers are widely utilized many cuisines as a spice to add heat to dishes. the substances giving chilli peppers their intensity when ingested or applied topically are capsaicinand related compounds referred to as capsaicinoids. chilli peppers orginated in mexico (Kraft et al., 2013). After the Colombian exchange many cultivars of chilli pepper sopread acrose the world used for both food and medicine. Chilli were one among the primary self-pollinating crops cultivated in mexico, central America and parts of south America Bosland, P.W. (1998). Peru is one among the country with highest cultivated capsicum due to center of diversification where shorts of all five domesticates were introduced, grown and consumed Eureka Alert. (2014). Bolivia is that the country where largest diversity of untamed capsicum is consumed. In 2016 world's production of raw green chilli pepper amounted to 34.5 million tons with china producing half (FAOSTAT, 2016).

2.2 Abiotic stress

In whole growing period plants got to confront an excellent deal of troublesome conditions due to the unstable environmental factors named biotic and abiotic stress. the biotic stress is virus, bacteria, fungus, different kinds of insect-pest attack and other forms of pathogenic attack on the opposite hand abiotic stress are adverse effect of low and high temperature, drought, water stagnation, salinity, metal toxicity etc. Abiotic stresses are generally connected with the changes of environmental conditions; it causes to reduce productivity of plants which directly involve food security.

The abiotic stresses incorporate saltiness, intense temperature, flooding, poisonous metal and metalloids, ultra-violate radiation etc. Some ecological components, alongside air temperature, can emerge as annoying in just a few minutes' others alongside soil water content can also take days to week and elements alongside mineral inadequacies can take an extended time to emerge as annoying (Taiz and Zeiger, 2006).

As indicated by (Araus *et al*., 2002) abiotic stresses alongside restricting harvest efficiency can also influence the distribution of plant species in various kind of climate. Abiotic stress is liable for change in soil-plant-climate continuum and as a result for diminished yield during a few of the many harvests in several sides of the world (Ahmad and Prasad, 2012).

Bray *et al*., (2000) stated that The modern complete current total populace of 7.3 billion is prolonged to arrive at 8.5 billion by means of (2030), 9.7 billion out of 2050 (Hasanuzzaman et al., 2017). Despite the truth that populace is expanding, the harvest effectivity is not resembling to the measure of food request it making. To meet up food requirement for extra 2.4 billion people, 70% of grater food supply is wanted to World agriculture though it has a wonderful assignment battle with poverty, environment friendly us of natural resources and adjusting to international local weather exchange (Hasanuzzaman *et al*., 2014a).

2.3 Salinity

Salinity is quantity of salt dissolved in a physique of water which is calculated as the quantity of salt (in grams) dissolved in 1.0 kg of seawater. Salinisation is the procedure of rising the quantity of salt in water. Salinity is regarded as the most delatorious stress among

all abiotic stress (Shrivastava and Kumar, 2015). There is very few vegetation that are insensitive to sail salinity and the quantity of soil salinity is enhancing now a day. When salt is gathered in soil floor it occurs salinity and it can up word jostle the soil floor through capillary pore and via evaporation. Due to use of potassium fertilizer occurs salinity. Plant outgrowth and improvement is very much affected by soil salinity (Vidal *et al*., 2009).
25% of the complete irrigated land in the world has been injured by salt (Cuartero *et al,* 2006). Salt stress has polymorphous impact on growth and yield of plant by mean of three direct three ways. First, salinity hampered the uptakement of water that produces water stress which is termed as osmotic stress. Because of the ion uptakement in leaves it decrease the growth. Among all ions, Na+ reaches more harmful than other ions (Lopez-Climent *et al.*, 2008).

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2.4 Effect of salinity on chilli

Akinci *et al.* (2004) reported that Crop production in saline areas mainly depends upon successful germination, seedling emergence and establishment and efficient reproductive phase. Salt stress result in suppression of plant growth and development in the least growth stages, however, depending upon plant species, certain stages like germination, seedling or flowering stage might be the foremost critical stages for salts stress determind by (Khoshsokan *et al*., 2012).

An experiment run by Gandonou and Skali, (2015) and reported that Plant growth is adversely affected at different developmental stage by salinity. In the Bangladesh costal vegetable crops management system, plants were irrigated from young plants staged to harvest two times every day. It is important for studying salt effect on reproductive stage

in such context, to irrigate plants from young plants stage to flowering and fructification.

Bybordi, (2010) conducted an experiment to review the salinity stress effects resulted from common salt like sodium chloride on germination, vegetative growth, elements concentration and proline accumulation in five canola cultivars. The results showed that different levels of salinity stress have significant effect on germination percentage, germination speed, shoot and root length. within the pot experiment, there was a serious effect on plant height, leaf area, dry matter, elements

concentration, proline accumulation and seed yield due to salinity stresss According to Shrivastava and Kumar (2015), salinity adversely impacts reproductive improvement with the aid of inhabiting micro sporogenesis and stamen filament elongation, bettering programed phone loss of life in some tissue types, ovule abortion and senescence of fertilized embryos. These consequences had been the consequences of a low osmotic workable of soil answer (osmotic stress), unique ion results (salt stress), dietary imbalances, or an aggregate of these elements.

Salt stress additionally diminished fruit number, measurement and clean mass in our chili pepper cultivar. Ashraf, (2004). Similar consequences had been stated in different chili pepper cultivar Sandia through Huez-Lopez *et al*., (2011) who found that the imply sparkling fruit yields reduced as soil salinity increased. In three different chili pepper cultivars, Rahim *et al*., (2013) mentioned that salinity decreased the proportion of fruit set, yield and common fruit weight corroborating results conditions.

Khan *et al*., (2009) carried out a test on the impact of seed priming with salicylic acid (SA) and acetylsalicylic acid (ASA) in enhancing seed energy and salt tolerance of hot pepper. They discovered that hormonal priming, especially with acetylsalicylic acid, can be an appropriate therapy for warm pepper to beautify uniformity of emergence and seedling institution beneath everyday as properly as saline.

Cho and Chung (1997) illustrated that fruit size, clean and fruit dry weight of kick back

lowered with elevated salinity. They additionally referred to that the proportion of puffy fruits was once decreased greater salinity.

Nawaz *et al.*, (2010) carried out a learn about of salt tolerance induction in two cultivars of sorghum through exogenous utility of unique stages (0, 50 mM and a hundred mM) of proline. Salt redress (100 mM) adversely affected the germination percentage, increase and chlorophyll contents of each cultivar. However, purposes of proline alleviated the detrimental consequences of salt stress. However, excessive attention of proline (100 mM) used to be now not as a great deal wonderful as in contrast to low attention i.e. 50 mM in each cultivars

Salt tolerance of 5 cultivars of Capsicum annuum L. have been evaluated through (Niuet *et al*., 2010). Seedlings have been transplanted in late May to subject raised beds containing loamy sand soils in a semi-arid environment. Plants have been properly irrigated in the course of the experiment. Three saline answer treatments, organized with the aid of including NaCl, MgSO4 and CaCl2 to faucet water at exceptional quantities to create three salinity ranges of 0.82 ds m-1 (control, faucet water), 2.5 dS m-1, and 4.1 dS m-1 electrical conductivity (EC), had been initiated on fifteenth June and ended in late August. The most tolerant to salinity had the lowest leaf Na+ accumulation whilst the touchiest to salinity had the easiest Na+ in the leaves

Houimli *et al.*, (2008) investigated the inhibitory impact of salinity on pepper plants. A temporary scan was once performed in greenhouse to check exceptional concentrations of 24-epibrassinolide via foliar software on increase and development. They determined that its consequences have been greater reported on the shoot than root growth. An exogenous furnish of 24-epibrassinolide was once discovered to be profitable in assuaging of the inhibitory results of salt stress on shoot increase parameters and the leaf relative water contents. Regarding biochemical evaluation, the sugar; praline content material accelerated with growing salinity degree the place as protein content material reduced in the physiologically lively leaves of specific remedies for all the sorts of wheat.

A test used to be carried out by way of Bajehbaj (2010) to consider the results of NaCl priming with KNO3 on the germination features and seedling boom of 4 sit back cultivars underneath salinity conditions. Experiment was once performed the usage of a number osmotic pressures caused through NaCl (5, 10, 15, 20 and 25 dS/m). Results confirmed that germination share of primed seeds used to be larger than that of un-primed seeds. Radicle length, seedling top and dry weight and leaf wide variety of flora derived from primed seeds had been greater in contrast with un-primed seeds. Na content material of flora derived from primed seeds used to be greater than that of un-primed ones. In contrast, K content material of priming resulted plantlets was once comparatively higher in contrast with un-primed counterparts.

Golezanik and Esmaeilpour, (2008) investigated the impact of salt priming (3% KNO3 for three days and 1% NaCl for two days at 20˚C) on germination, seedling emergence and seedling dry weight of two Iranian chilli cultivars viz. Basmenj and Varamin harvested at 25, 35 and forty-five days after anthesis (DAA) in an unheated glasshouse. Maximum gain of priming seedling vigour used to be discovered in seeds harvested at 25 DAA. Smaller consequences of priming have been additionally considered in the reduced suggest germination and emergence instances and extended seedling dry weight of seeds harvested at 35 and forty-five DAA. In all cases, KNO3 priming was once extra positive than NaCl priming. Therefore, KNO3 priming can be used to enhance chilli seedling emergence and establishment, mainly in early spring sowings at low temperatures.

Cho *et al*., (1996) indicated that whole fresh dry weight, size of fruit and yield of chilli fruits diminished increasing salinity.

Hajer *et al.*, (2006) performed a scan on impact of sea water salinity (1500, 2500 and 3500 ppm) on the boom of pepper (Capsicum frutescence) cultivars. They observed that sea water salinity delayed seed germination and decreased germination proportion mainly with growing salinity level. Chlorophyll b content material was once greater than chlorophyll a, and each of them diminished with growing salinity.

Midan *et al.*, (1985) carried out a scan to learn about the consequences salinity on chilli yield. The weight of person fruit lowered with the extended salinity levels.

Lycopene as properly as different antioxidants like vitamin C play antagonistical against biotic and abiotic stress. Stress prompted through NaCl therapy can be eradicated by the way of the mechanism of antioxidative enzymesas a tolerance (Mittova *et al.*, 2000).

smidova and Izzo, (2009) carried an experiment to deside the adjasment content with the maturity stage below special degrees of salinity. He viewed were lipoic acid vitamin C and vitamin E as antioxidant parameters.

Shi and Le maguey, (2000) start deep pink coloration is produced due to the pastime of lycopene which has some physio- chemical residence towards salinity stress.

Yong-Gen *et al*., (2009) performed an test to describe the mechanisms, of the transport of carbohydrates into tomato fruit s and law of starch synthesis at some stage in development tomato plant the place dealt with the tomato flower with grater salinity.

Ascorbic acid (vitamin C) is a necessary nutrient which happens extensively in crop ingredients products, specifically in sparkling fruits and inexperienced leafy veggies (Ratnakar and Rai, 2013).

It is a small, water soluble, antioxidant molecule which acts as a major substrate in the cyclic pathway of enzymatic detoxing of hydrogen peroxide (Beltagi, 2008).

Vitamin C additionally helps in absorption of dietary iron through preserving it in the decreased shape (Ratnakar and Rai, 2013). Our effects disclose that in fruits of C. frutescens cv. Adologbo, the ascorbic acid content material lowered drastically below NaCl stress. In different greens such as amaranth species leaves, Ratnakar and Rai (2013) discovered a minimize of ascorbic acid content material with extend of salt concentration, whereas Wouyou *et al*. (2017) suggested a contrary response in other amaranth cultivar. In

tomato fruits, the amplify of ascorbic acid contentsunder salt stress used to be said (Stamatakis *et al*., 2003; Kim *et al*., 2008; Gautier *et al.*, 2010). The effects of the current learn about disclose that salt stress decreased chili pepper fruit dietary first-rate by using in most cases reducing vitamins concentrations however enlarge fruit tangy look through growing capsaicinoids attention

Physiological and biochemical tactics are associated with the genotype stress interaction to discover out the salinity tolerance genotypes and the manner is complex (Khan *et al.*, 2010).

Growth is the most dominant indicator of salinity tolerance which is the penalties of physiological response (Jaleel *et al*., 2008), which is a consequence of various physiological responses that consists of the amendment of ion balance, water status, mineral nutrition, photosynthetic efficiency, carbon allocation and utilization, membrane instability, ethylene attention and failure in the maintenance of turgor stress (Yildirim *et al*., 2006)

There are some ions that current in greater attention in saline circumstance specially Na+ and Cl- that produce a broad range of physiological and biochemical modifications and ultimately progress of plant is inhibited (Taffouo *et al*., 2010)

Mechanisms like low water potential, ion toxicity, interference of ions with the uptake of nutrients mainly K+ are related with salinity stress that inhibit the progress of plant (Tester and Davenport, 2003). As Na+ and Cl- ion concentration becomes greater in saline condition, nutrient imbalance and nutrient uptake are. Some parameters like membrane balance index, ethylene content, chlorophyll content, relative water content, moisture and dry count content material in fruit, Na+ and K+ ion content, and so forth are negatively affected via salinity stress (Turan *et al*., 2007). Plant genotypes and environmental situation determines the diploma to which the factors affected (Zadeh *et al.*, 2008).

CHAPTER III
MATERIALS AND METHOD

The experiment was conducted during the period from November 2018 to April 2019 to learn about the genetic analysis of yield contributing traits of chilli against salt stress by using sodium (Na+) which used as a form of sodium chloride (Nacl). The materials and methods that had been used for conducting the experiment have been introduced in this chapter. It consists of a quick description of the location of experimental site, soil and local climate condition of the experimental area, substances used for the experiment, diagram of the experiment, data collection and data analysis procedure.

3.1 Location of the experimental site

The experiment was conducted in the net house of the department of Genetics and Plant Breeding, Sher-e-Bangla Agricultural University, Dhaka-1207 during the periods from November 2018 to April 2019. Location of the site is 23°74' N latitude and 90°35' E longitude with an elevation of 8 meter from sea level (Anonymous, 2014) in Agro-ecological zone of "Madhupur Tract" (AEZ-28) (Anonymous, 1988). The experimental site is shown in Appendix I.

3.2 Planting material

A complete of ten genotypes had been used in this test (Table 1). Ten genotypes have been collected from Department of Genetics and Plant Breeding, Sher-e- Bangla Agricultural University, Dhaka

Table 1. Name and source of collection of ten chilli genotypes used in experiment

Sl. No.	Genotypes No.	Accession No./ Variety Nam	Source of collection
01	G1	DEB 1302	Department of Genetics and Plant Breeding, SAU.
02	G2	Bogura Zhal Morich	Department of Genetics and Plant Breeding, SAU.
03	G3	Bogura Special Morich	Department of Genetics and Plant Breeding, SAU.
04	G4	Black Lady	Department of Genetics and Plant Breeding, SAU.
05	G5	CO 525	Department of Genetics and Plant Breeding, SAU.
06	G6	SRC04	Department of Genetics and Plant Breeding, SAU.
07	G7	SRC07	Department of Genetics and Plant Breeding, SAU.
08	G8	SRC03	Department of Genetics and Plant Breeding, SAU.
09	G9	SRC06	Department of Genetics and Plant Breeding, SAU.
10	G10	SRC10	Department of Genetics and Plant Breeding, SAU.

SAU= Sher-e-Bangla Agricultural University

3.3 Treatment in the experiment

Having two factors experiment was carried out to select the chilli genotypes under different salt stress treatments. Factor A used to be chilli genotypes where ten chilli genotypes had been used. Factor B was different sodium chloride (NaCl) salinity treatments. Three Salinity treatments have been used named T1 (control), T2 (4 dS/m, T3 (8dS/m).

3.4 Design and layout of the experiment

The research work was laid out and evaluated during Rabi season in Completely Randomized Design (CRD) using two factors. Factor A contain ten genotypes and Factor B contain 3 distinct salinity treatments. The experiment was conducted in 3 replications and total 90 plastic pots had been used. Each replication had 30plants and each plastic pot contain one plant

3.5 Climate and soil

Experimental site was located in the tropical climatic zone. Sunshine different within experimental unit. Physicochemical properties of the soil are presented in Appendix III.

3.6 Raising of seedling

Seeds of ten genotypes of chilli had been sown on separate pot during the midweek of November 2018. Seeds had been treated with fungicides before sowing. Pots for seed germination had been filled up with 7 kg soil and mixed with cow dung, Urea, Mutate of Potash and Triple super phosphate with a lower dose. Watering of Seedling was done carefully.

3.7 Manure and fertilizers application

Soil was properly pulverized and dried in the sun and only well decomposed cow dung was once blended with the soil according to the recommendation guide BARI, 2012). Well decomposed cow dung was calculated for each pot considering the dose of 1-hectare soil at the depth of 20 cm, one million kg. On an average each plastic pot was filled with soil containing 100 g decomposed cow dung (10 tons/hectare). Total decomposed cow dung was applied before transplanting the seedlings to plastic pots.

3.8 Pot preparation and transplanting of seedlings

Weeds and stubbles have been absolutely eliminated from soil which was used for planting. Formaldehyde (45%) for 48 hours was used to treat the soil earlier than filling plastic pots to make it free from pathogens. Before two days of transplanting pots had been filled up with prepared soil. Each pot was filled with 7 kg of soil. The pot dimension used to be 20 cm in height, 30 cm in pinnacle diameter and 20 cm in backside diameter. The pot dimension used to be 20 cm in height, 30 cm in pinnacle diameter and 20 cm in backside diameter. When the seedlings end up 28 days old, they had been transplanted in the essential plastic pot (one plant/pot).

3.9 Application of salinity treatment

Ten genotypes have been accomplished below three treatment of salinity (T1: Control condition; T2: 4 dS/m, and T3: 8 dS/m). Plants in control treatments (T1) were not exposed to salinity; whereas T2, and T3 plants were treated with 4 dS/m, and 8 dS/m salinity level respectively. Salt used to be combined with water and EC value used to be measured. Plants in control treatments (T1) were always irrigated with fresh (non-saline water). Saline solution was applied to T2, and T3 and at 10 DAT for the well establishment of young seedlings and later on each pot was watered as per treatment. Electrical conductivity of different salinity levels in soil was adjusted by a direct reading conductivity meter (EC-meter).

3.10 Intercultural operation

Necessary watering and intercultural operations had been furnished as and when required. Weeding used to be carried out in all pots as and when required to keep plants free from weeds. Disease and pests is a limiting factor to chilli production. During this test no sizable contamination used to be discovered and no fungicides and pesticides have been used. When plants were well established, stalking was done by bamboo stick between 25-30 DAT to keep the plants erect.

3.11 Harvesting and processing

Harvesting of fruits was done after maturity stage. Mature fruits had been harvested when

fruits grew to become to purple in color. The fruits per plant have been allowed to ripe and then seeds have been accrued and saved at 4oC for future use. Harvesting was started from March and completed by April

3.12 Data recording

Data had been recorded from every pot primarily based on exceptional yield and yield contributing, physiological and nutritional traits.

3.12.1 Agromorphogenic traits

Data related to yield and yield attributing characteristics such as plant height, number of leaves per plant, leaf area, number of branches per plant, days to first flowering, days to first fruit setting, average fruit weight, fruit diameter, fruit length, root length, yield per plant had been recorded throughout conducting the experiment.

3.12.1.1 Plant Height (cm)

Plant height of each plant from each pot was measured during its mature stage by centimeter scale.

3.12.1.2 Number of leaves per plants

Number of leaves per plant was recorded during maturity stage of plants.

3.12.1.3 Leaf area (cm^2)

Leaf area was measured by taking the breath and width of leaf and multiplying their value from each of the plant.

3.12.1.4 Number of branches per plant

Number of branches per plant was counted from each of the pot during its mature stage.

3.12.1.5 Days to first flowering

Number of days used to be counted from the date of chili seedlings transplanting to date of first flowering.

3.12.1.6 Days to first fruit setting

Number of days used to be counted from the date of chili seedlings transplanting to date of first fruit setting

3.12.1.7 Number of fruit per plant

The total number of marketable fruit from each plant was recorded during harvesting.

3.12.1.8 Average fruit weight (g)

Five fruits from each plants were measured and their average weight was taken

3.12.1.9 Average fruit length and diameter

Fruit length and diameter were measured using Digital Caliper-515 (DC-515) in milimeter (mm). Later it was converted to centimeter (cm).

3.12.1.10 Average fruit weight

Fruit weight was measured by electric precision balance. Average fruit weight per Plant was recorded by randomly selecting five fruits per plant and mean value was calculated.

3.12.1.11 Yield per plant

Yield per plant was recorded from all harvests of each plant and expressed in gram (g) per plant.

3.12.1.12 Root length (cm)

At the end of the season each plant was uprooted from the pot and their root was cut and washed by water. Length of root was measured by centimeter scale

3.12.2 Physiological traits

Physiological traits such as chlorophyll content in leaf, and Relative water content (RWC) were recorded.

3.12.2.1 Measuring of chlorophyll content

Leaf chlorophyll content was determined by using SPAD-502 plus Portable Chlorophyll meter. The chlorophyll content was measured from leaves stressed at different drought treatments from four different portion of the leaf and then averaged for analysis.

3.12.2.2 Determination of Relative Water Content (RWC)

The relative water content (RWC) was estimated according to Bars and Weatherly (1962). The fresh weight of the whole plant was recorded. The plant was floated in water under light until the weight stayed constant to attain full turgid and turgid weight was recorded. Then the plant was kept in hot air oven at 80°C for 48 hours and the dry weight was recorded. The relative water content (RWC) was calculated y using following formula,

Relative water content (%) = (Fresh weight – Dry weight)/ (Turgid weight − Dry weight) x 100

3.13 Statistical analysis

Collected data were statistically analyzed using Statistic 10 program. Mean for every treatment were calculated and analysis of variance for each character was performed. Genotype treatment interaction was also performed. Comparison among all treatments was assessed by Least Significant Difference (LSD) test at 5% level of significance (Gomez and Gomez, 1984).

3.13.1 Analysis of variance

The analysis of variance for different characters was carried out utilizing mean data in order to assess the genetic variability among populations as given by Cochran and Cox (1957). The level of significance was tested at 5% and 1% using F test. The model of ANOVA used is presented below:

Sources of variation	**Degrees of freedom (D.F.)**	**Mean sum of squares (MS)**	**Expected MS**
Replication	(r-1)	Mr	$p\,\sigma_r^2 + \sigma_e^2$
Population	(p-1)	Mp	$r\,\sigma_p^2 + \sigma_e^2$
Error	(p-1) (r-1)	Me	σ_e^2
Total	(rp-1)		

Where, p = number of treatments (population)

r = number of replications

σ_r^2 = variance due to replications

σ_p^2 = variance due to treatments (population)

σ_e^2= variance due to error

To test significance of the difference between any two-adjusted genotypic mean, the standard error of mean was computed using the formula**:**

$$\text{S. E} = \sqrt{\frac{2\text{Me}}{\text{r}}}\ (1 + \frac{\text{rqu}}{\text{q} + 1})$$

Where, S. E = Standard error of mean

Me = Mean sum of square for error (Intra block)

r = Number of replications

q = Number of population in each sub-block

u = Weightage factor computed

3.13.2 Estimation of Least Significant Differences (LSD)

Least Significant Differences were estimated according to the formula of Gomez and Gomez (1984).

$$LSD_\alpha = t_\alpha \sqrt{\frac{s^2}{r}}$$

Here, α = Level of significance, t= tabulated t value with concerned df at same level of significance, s^2= Error Mean Sum of Square and r = Number of replication.

3.13.3 Study of variability parameters:

Estimation of the variability among the populations for traits related to yield per plant in *Brassica rapa* L. were narrated below:

3.13.4 Estimation of Genotypic variance and phenotypic variance:

To estimate phenotypic and genotypic components of variance, Johnson *et al.* (1955) suggested a formula which is mentioned below:

a. Genotypic variance, $\sigma_g^2 = \frac{\text{MSG}-\text{MSE}}{\text{r}}$

Where,

MSG = Mean sum of square for genotypes

MSE = Mean sum of square for error, and

r = Number of replication

b. Phenotypic variance, $\sigma_p^2 = \sigma_g^2 + \sigma_e^2$

Where,

σ_p^2= Phenotypic variance

σ_g^2= Genotypic variance

σ_e^2 = Environmental variance = Mean square of error

3.13.5 Estimation of genotypic and phenotypic coefficient of variation:

To compute genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) for all the characters, following formula was given by Burton, 1952:

$$\text{GCV} = \frac{\sigma_g \times 100}{\bar{x}}$$

$$\text{PCV} = \frac{\sigma_p \times 100}{\bar{x}}$$

GCV = Genotypic coefficient of variation

PCV = Phenotypic coefficient of variation

σ_g= Genotypic standard deviation

σ_p= Phenotypic standard deviation

$\bar{x}$ = Population mean

Sivasubramanian and Madhavamenon (1973) categorized phenotypic coefficients of variation (PCV) and genotypic coeffcients of variation (GCV) as

Low (0-10%),

Moderate (10-20%) and

High (>20%)

3.13.6 Estimation of heritability in broad sense:

Singh and Chaudhary (1985) suggested a formula to estimate broad sense heritability which is given below:

$$h_b^2(\%) = \frac{\delta_g^2}{\delta_p^2} \times 100$$

Where, h_b^2=Heritability in broad sense

σ_g^2= Genotypic variance

σ_p^2= Phenotypic variance

Robinson *et al.* (1966) suggested the following categories for heritability estimates in cultivated plants:

Categories: Low: 0-30%

Moderate: 30-60%

High: >60%

3.13.7 Estimation of genetic advance:

Allard (1960) suggested the following formula which was used to estimate the expected genetic advance for different characters under selection:

$$GA = \frac{\sigma_g^2}{\sigma_p^2} . K . \sigma_p$$

Where,

GA = Genetic advance

σ_g^2 = Genotypic variance

σ_p^2 = Phenotypic variance

σ_p = Phenotypic standard deviation

K= Standard selection differential which is 2.06 at 5% selection intensity.

Categories: Low (<10%)

Moderate (10-20%)

High (>20%)

3.13.8 Estimation of genetic advance in percentage of mean:

Following formula was given by Comstock and Robinson (1952) to compute genetic advance in percentage of mean:

$$\text{GA in percent of mean} = \frac{\text{GA}}{\text{Grand mean}} \times 100$$

Johnson *et al.* (1955) suggested that genetic advance in percent of mean was categorized into following groups:

Categories:

Less than 10% - Low

10-20% -Moderate

More than 20% -High

CHAPTER IV

RESULTS AND DISCUSSION

The experiments were conducted to determine the genotypes which gives better performance under salinity condition based on agromorphogenic, physiological and nutritional traits. The experiments were conducted with ten genotypes of chili using CRD design with three replications. In the experiment, three treatments were T_1; control, T_2; 4 ds/m, and T_3; 8 ds/m. ANOVA and reduction percentage for salinity are presented in appendix IV and Appendix V respectively. Data are presented in tables and figures for salinity experiment. The morphological development of chilli plant under control and stress condition is shown in plate 1. Results have been presented, discussed under the following headlines

4.1 Agromorphogenic traits

Agromorphic traits such as plant height, no. of leaves, leaf area, no. of branches per plant, days to first flowering, days to first fruit setting, no. of fruits per plant, fruit length, fruit diameter, average fruit weight, root length have been discussed. Data are presented in table, figures for better understanding.

4.1.1 Plant height (cm)

It was observed from the result of the experiment that plant height showed statistically significant variation among ten genotypes of chili (Appendix IV). The tallest plant was obtained from G_6 (65.83 cm) (Table 2) whereas shortest plant was found in G_1 (30.16 cm) which was statistically similar with G_{10} (30.83cm) (Table 2). The chili genotypes showed statistically significant variation to salinity treatment in terms of plant height (Appendix IV). The tallest plant was found in T_1 treatment (52.73cm) (Table 3) whereas the shortest plant was found in T_3 (50.13 cm). This showed that plant height was gradually decreased with the increase in salinity condition

G1

T3 T2 T1

G2

T3 T2 T1

G3

T3 T2 T1

G4

T3 T2 T1

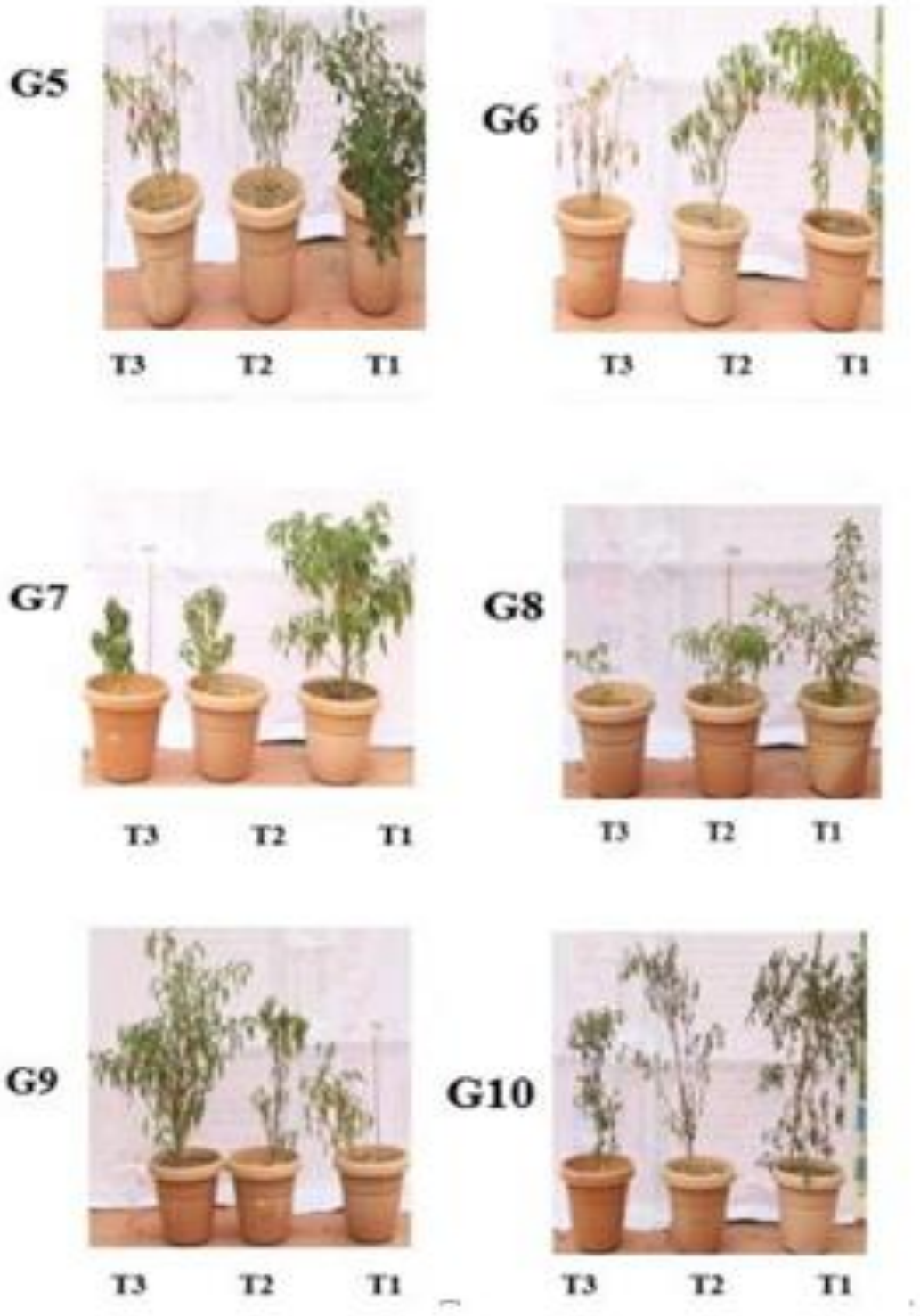

Plate 1: The morphological development of chili plant under control and stress

Table 2. Performance of chili genotype on plant height, number of leaves per plant and leaf area

Genotype	Plant height (cm)	Number of leaves per plant	Leaf area(cm^2)
G_1	30.16 h	167.89 g	21.37 de
G_2	60.16 c	235.11 e	23.53 cd
G_3	63.50 b	205.44 f	29.76 b
G_4	52.16 f	290.00 b	20.63 ef
G_5	56.50 d	140.56 h	18.80 f
G_6	65.83 a	265.89 cd	23.93 c
G_7	50.83 fg	263.89 d	33.49 a
G_8	53.83 e	210.00 f	14.91 g
G_9	50.16 g	280.56 bc	21.33 def
G_{10}	30.83 h	358.89 a	19.03 ef
CV%	3.42	6.89	11.82
LSD (0.05)	1.65	15.70	2.53

Ten chili genotypes coded from G1 to G10
In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Table 3. Performance of salinity treatments on plant height,number of leaves per plant and leaf area

Salinity Treatments	Plant height (cm	Number of leaves per plant	Leaf area(cm^2)
T_1	52.73 a	363.40 a	29.40 a
T_2	51.33 b	215.77 b	19.87 b
T_3	50.13 c	146.30 c	18.76 b
CV%	3.42	6.89	11.82
LSD (0.05)	0.91	8.60	1.38

Three salinity treatments viz. T_1, Control; T_2, 4 dS/m; T_3, 8dS/m;
In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability .

treatment. Similar result was also found by Bybordi (2010). The unavailability of water due to the salinity stress may be one of the main reasons for the decrease of plant height with increase of salinity level (Lopez-Climent *et al.*, 2008). Appendix IV showed that significant variation was found in genotypes and salinity interaction in case of plant height.

The tallest plant was found in G_6T_1 (66.83 cm) (Table 4) whereas the shortest plant was found in G_1T_3 (28.83 cm). Plant height was decreased with the increase of salinity levels. The reduction percentage in plant height with increase in salinity was shown in Appendix V. The highest reduction percentage was found in G_1 (9.42%) in T_3 treatment whereas the lowest reduction percentage was observed in G_6 (1.5%) under T_1 treatment (Appendix V and Figure 1)

4.1.2 Number of leaves per plant

Chili genotypes showed significant variation in case of number of leaves per plant (Appendix IV). The highest leaf number was found in G_{10} (358.89) whereas the lowest leaf number was observed in G_5 (140.56).

Ten genotypes of chili showed significant variation in term of number of leaves per plant under different salinity treatment (Appendix IV). The highest leaf number was found in T_1 (363.40) whereas the lowest leaf number was found in T_3 (146.30) (Table 3). It was observed from the table that leaves number was decreased with the increased of salinity.

Genotype salinity interaction was found significant in term of number of leaf per plant (Appendix IV). The highest number of leaves was observed in $G_{10}T_1$ (500.00) whereas the lowest leaf number was found in G_1T_3 (100.00) which was statistically similar with G_8T_2 ((105) (Table 4). From this table it was found that genotypes showed negative interaction with the increase of salinity level in terms of number of leaves per plant. Number of leaves per plant was found decrease with the increase of salinity. The highest reduction percentage was found in G_8 (73.75%) under T_3 treatment whereas the lowest reduction percentage was found in G_2 (18.71%) (Appendix V) (Figure1).

Table 4. Interaction effect of chilli genotypes and salinity treatments on plant height, number of leaves per plant and leaf area

Interaction	Plant height (cm)	Number of leaves per plant	Leaf area (cm^2)
G_1T_1	31.83 m	235.33 fgh	24.36 efg
G_1T_2	29.83 mn	168.33 kl	20.38 ghi
G_1T_3	28.83 n	100.00 n	19.36 hij
G_2T_1	61.83 cd	320.67 d	29.41 cd
G_2T_2	59.83 de	260.67 ef	20.58 fghi
G_2T_3	58.83 ef	124.00 m	20.60 fghi
G_3T_1	64.83 ab	254.67 efg	36.09 a
G_3T_2	63.83 bc	201.67 ij	26.33 de
G_3T_3	61.83 cd	160.00 kl	26.87 de
G_4T_1	53.83 hi	390.00 c	34.91 ab
G_4T_2	51.83 ijk	270.00 e	15.47 jklm
G_4T3	50.83 jkl	210.00 hi	11.50 mn
G_5T_1	57.83 ef	175.00 jkl	23.86 efg
G_5T_2	56.83 fg	125.00 m	14.69 lm
G_5T_3	54.83 gh	121.67 m	17.86 hijkl
G_6T_1	66.83 a	403.33 c	34.16 ab
G_6T_2	65.83 ab	275.33 e	20.50 ghi
G_6T_3	64.83 ab	119.00 m	17.13 ijkl
G_7T_1	51.83 ijk	451.67 b	37.73 a
G_7T_2	50.83 jkl	185.00 ijk	31.30 bc
G_7T_3	49.83 kl	155.00 l	31.45 bc
G_8T_1	54.83 gh	400.00 c	24.92 ef
G_8T_2	53.83 hi	125.00 m	9.98 n
G_8T3	52.83 hij	105.00 n	9.85 n
G_9T_1	51.83 ijk	453.33 b	26.72 de
G_9T_2	49.83 kl	230.00 gh	19.08 hijk
G_9T_3	48.83 l	158.33 kl	18.20 hijkl
$G_{10}T_1$	31.83 m	550.00 a	21.86 fgh
$G_{10}T_2$	30.83 mn	316.67 d	20.41 ghi
$G_{10}T_3$	29.83 mn	210.00 hi	14.83 klm
CV%	3.42	6.89	11.82
LSD (0.05)	2.87	27.20	4.38

Ten genotypes coded from G_1 to G_{10} and three salinity treatments viz. T_1, Control; T_2, 4dS/m; T_3,8dS/m. In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

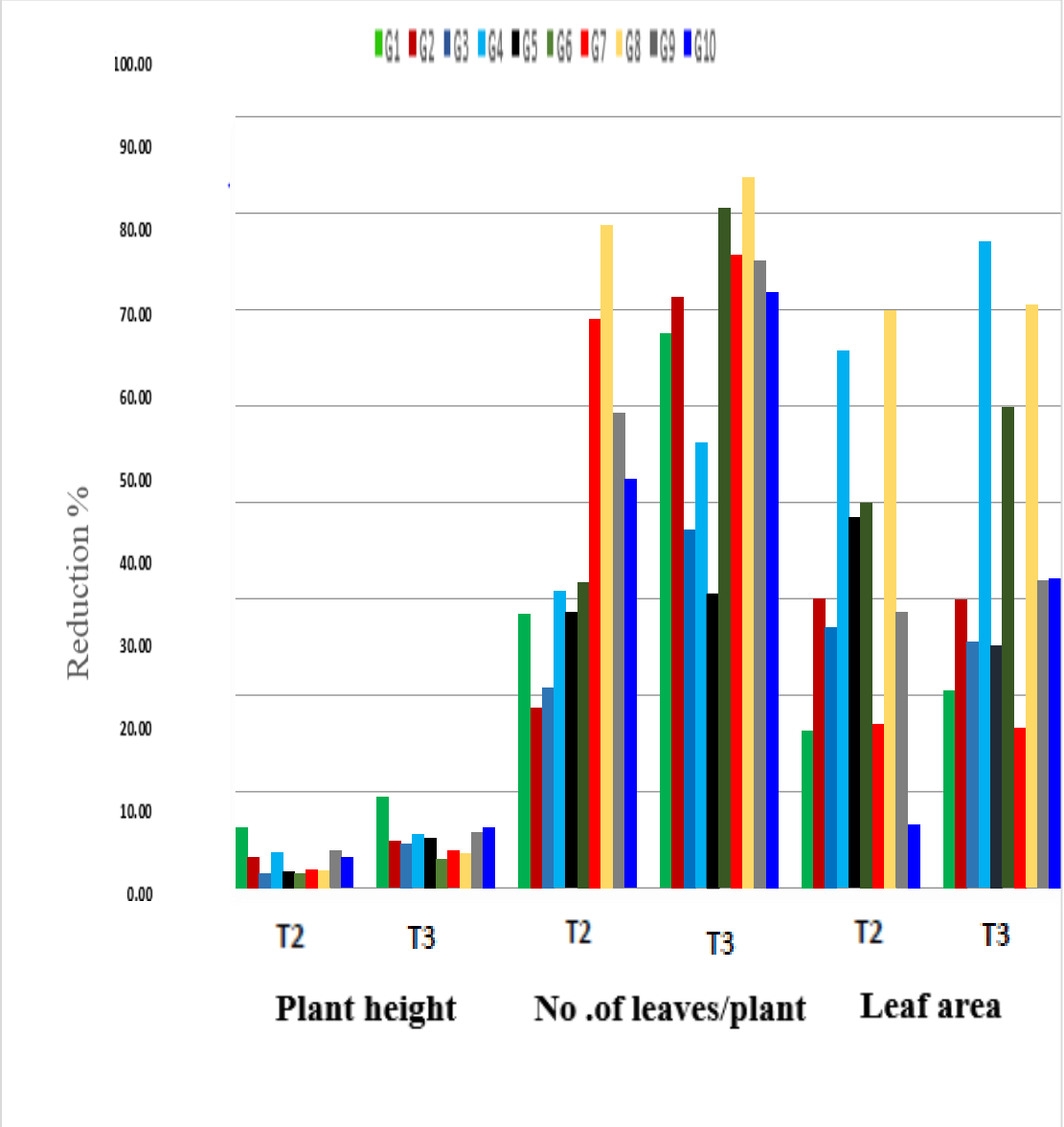

Figure 1. Reduction percentage in Plant height, No. of leaves/plant and leaf area under increase in salinity

4.1.3 Leaf area

Ten chilli genotypes showed significant variation in term of leaf area (appendix IV). the highest leaf area was found in G_7 (33.49 cm^2) and lowest leaf area was found in G_5 (18.80 cm^2) (table 2). Ten chilli genotype showed significant variation in term of leaf area under salinity treatment (appendix iv). The lowest leaf area was found in T_3 (18.76 cm2) and the highest leaf area was found in T_1 (29.40 cm^2) (table3).

It was observed from the table that leaf area was reduced under the increase of salinity. Leaf area performed significant variation among interaction between genotypes and salinity (Appendix IV). The highest leaf area was found in G_7T_1 (37.73cm^2) which is similar to G_3T_1 (36.09). Whereas lowest leaf area was found in G_8T_2 (9.98 cm^2) Which was similar to G_8T_3 (9.85) (Table 4). Leaf area was reduced under different salinity treatment. The highest reduction percentage in case of leaf was found in G4 (67.05%) in T_3 treatment whereas the lowest reduction percentage was found in G_1 (16.33%) under T_2 treatment (Appendix V) (Figure1)

4.1.4 Number of branches per plant

Number of branches per plant was found significant among ten genotypes of chilli (Appendix IV). The maximum number of branches per plant was found in G_7 (7.44) which was statistically similar to G_9 (7.44) whereas the minimum number of branches per plant was found G_4 (4.44) (Table 5). The branches per plant showed significant variation in genotypes under salinity Treatment (Appendix IV). The maximum number of branches was found in T_1 (7.93) whereas the minimum branches per plant was found in T_3 (4.33) (Table 6). From this table it was shown that number of branches per plant was reduced with the increase the salinity level.

The number of branches per plant was found statistically significant in interaction among salinity and genotypes (Appendix IV). The highest number of branches per plant was found in G_7T_1 (10.66) whereas the lowest number was found in G_4T_3 (2.66) (table 7).

Number of branches per plant was reduced with the increase of salinity. Reduction percentage in number of branches per plant was shown in Appendix V. The highest reduction percentage was found in G_3 (60.83%) in T_3 whereas the lowest reduction

percentage was found in G_6 (-12.57%) under T_2 treatment (Appendix V and Figure 2).

4.1.5 Days to first flowering

Ten genotypes were found statistically significant in terms of days to first flowering (Appendix IV). The longest time for days to flowering was found in G_7 (65.11days) Whereas the shortest time for days to first flowering was found in G_5 (38.00 days) which was statistically identical to G_1 (40.55), G_2 (39.11) and G_8 (40.11) (Table 5). Days to first flowering was found statistically insignificant under different salinity treatment (Appendix IV).

The longest time for days to first flowering was found in T_1 (54.60days) whereas the shortest time was found in T_3 (48.13 days) (Table 6). Interaction of chili genotypes and salinity treatments affected statistically significant in terms of days to first flowering (Appendix IV). The longest time for days to first flowering was found in G_7T_2 (66.66days) whereas the shortest days to first flowering was found in G_5T_1 (36.00 days) (Table 7).

The ten genotypes of chili were found variation with the increase of salinity level. The shortest days to first flowering (maximum reduction percentage) was found in G_1 (5.00%) in T_3 treatment and the longest days to first flowering (minimum reduction percentage) was found in G_9 (-29.47%) in T_2 treatment (Appendix V and Figure 2).

Table 5. Performance of chilli genotypes on No. of branches per plant, Days to first flowering, days to first fruit setting

Genotype	No. of branches /plant	Days to first flowering	Days to first fruit setting
G_1	5.22 cd	40.55 e	54.22 ef
G_2	6.44 ab	39.11 e	74.33 b
G_3	5.22 cd	59.77 b	53.11 ef
G_4	4.44 d	55.11 cd	74.44 ab
G_5	6.77 ab	38.00 e	68.66 cd
G_6	5.11 cd	56.55 c	51.55 f
G_7	7.44 a	65.11 a	71.44 bc
G_8	5.88 bc	40.11 e	77.44 a
G_9	7.44 a	52.77 d	54.66 e
G_{10}	6.55 ab	60.77 b	67.66 d
CV%	20.37	5.36	5.00
LSD (0.05)	1.16	2.57	3.05

Ten chili genotypes coded from G_1 to G_{10}

In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level

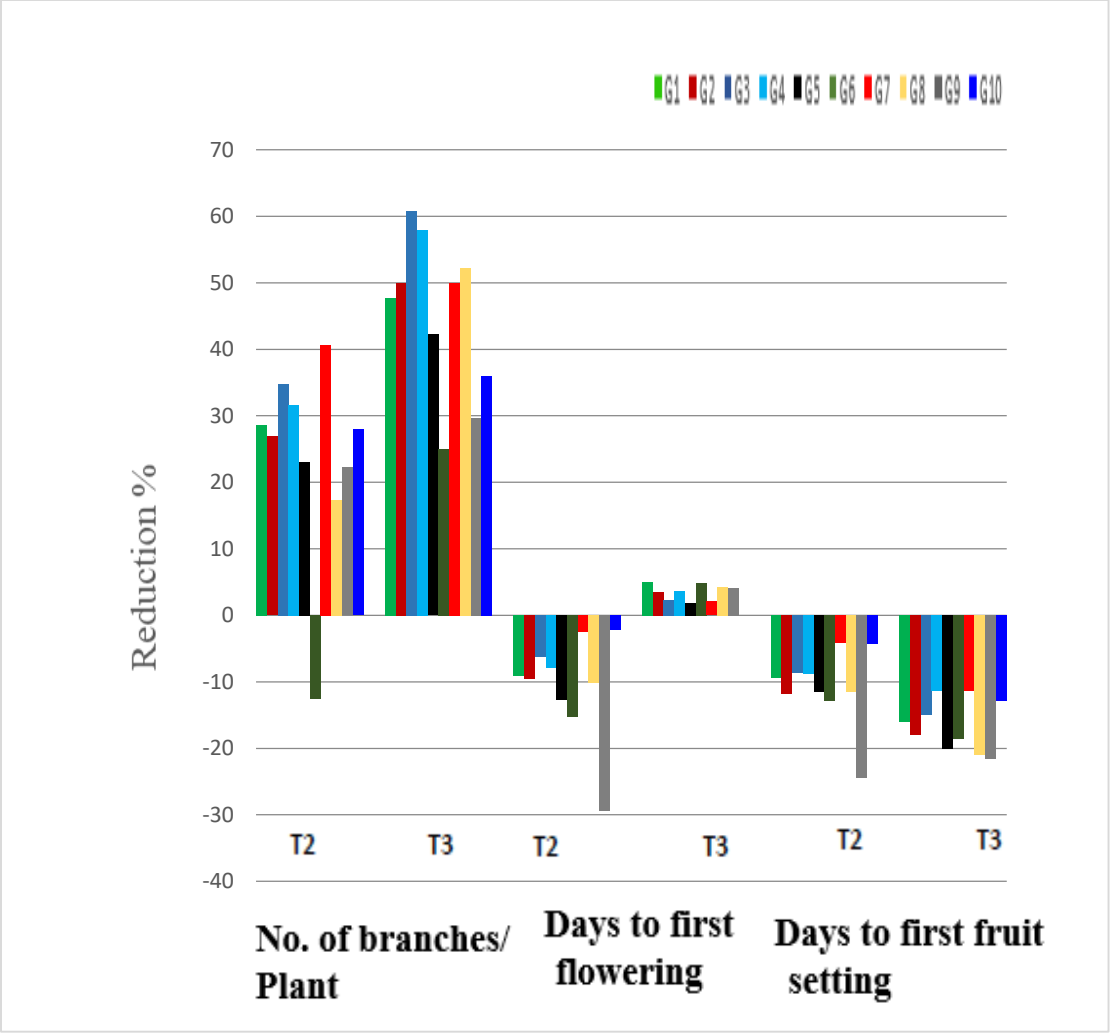

Figure 2. Reduction percentage in No. of branches/plant, Days to first flowering and days to first fruit setting under increasing salinity

Table 6. Performance of salinity treatments on No. of branches per plant, Daysto first flowering, days to first fruit setting

Salinity treatments	No. of branches /plant	Days to first flowering	Days to first fruit setting
T_1	7.93 a	54.60 a	59.50 c
T_2	5.90 b	49.63 b	65.66 b
T_3	4.33 c	48.13 c	69.10 a
CV%	20.37	5.36	5.00
LSD (0.05)	0.64	1.41	1.67

Three salinity treatments viz. T_1, Control; T_2, 4 dS/m; T_3, 8dS/m;
In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability.

Table 7. Interaction effect of tomato genotypes and salinity treatments on No. of branches per plant, days to first flowering and days to first fruit setting

Interaction	No. of branches /plant	Days to first flowering	Days to first fruit setting
G_1T_1	7.00 bcdef	40.00 lmno	50.00 klmn
G_1T_2	5.00 fghij	43.66 kl	54.66 hijk
G_1T_3	3.66 ijk	38.00 mno	58.00 hi
G_2T_1	8.66 abc	38.33 mno	48.33 mn
G_2T_2	6.33 defg	42.00 lm	54.00 ijkl
G_2T_3	4.33 ghijk	37.00 no	57.00 hij
G_3T_1	7.66 bcde	59.00 def	69.00 ef
G_3T_2	5.00 fghij	62.66 abcd	75.00 bcd
G_3T_3	3.00 jk	57.66 efg	79.33 ab
G_4T_1	6.33 defg	54.33 gh	64.33 fg
G_4T_2	4.33 ghijk	58.66 defg	70.00 de
G_4T_3	2.66 k	52.33 hi	71.66 cde
G_5T_1	8.66 abc	36.00 o	46.66 n
G_5T_2	6.66 cdef	41.33 lmn	52.00 jklm
G_5T_3	5.00 fghij	36.60 o	56.00 hij
G_6T_1	5.33 fghi	54.66 fgh	64.66 fg
G_6T_2	6.00 efgh	63.00 abcd	73.00 cde
G_6T_3	4.00 hijk	52.00 hi	76.66 bc
G_7T_1	10.66 a	65.00 ab	73.66 cde
G_7T_2	6.33 defg	66.66 a	76.66 bc
G_7T_3	5.33 fghi	63.66 abc	82.00 a
G_8T_1	7.66 bcde	39.33 lmno	49.33 lmn
G_8T_2	6.33 defg	43.33 kl	55.00 hijk
G_8T_3	3.66 ijk	37.66 mno	59.66 gh
G_9T_1	9.00 ab	48.60 ij	58.66 hi
G_9T_2	7.00 bcdef	63.00 abcd	73.00 cde
G_9T_3	6.33 defg	46.66 jk	71.33 de
$G_{10}T_1$	8.33 bcd	60.33 cde	70.33 de
$G_{10}T_2$	6.00 efgh	61.66 bcde	73.33 cde
$G_{10}T_3$	5.33 fghi	60.33 cde	79.33 ab
CV%	20.37	5.36	5.00
LSD (0.05)	2.015	4.45	5.29

Ten genotypes coded from G_1 to G_{10} three salinity treatments viz. T_1, Control; T_2,4dS/m.; T_3,8dS/
In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probabiliy

4.1.6 Days to first fruit setting

Chili genotypes showed significant variation in term of days to first fruit setting (Appendix IV). The longest days to first fruit setting was found in G_8 (77.44 days) and the shortest days to first fruit setting was found in G_6 (51.56 days) (Table 5). Days to first fruit setting was found significant under salinity treatment (Appendix IV). The longest days to first flowering was found in T_3 (69.10days) whereas the shortest days to first fruit setting was found in T_1 (59.50 days) (Table 6). Interaction of chili genotypes and salinity treatments were affected non significantly in terms of days to first fruit setting (Appendix IV). The longest days to first fruit setting was found in G_7T_3 (82.00days) whereas the shortest days to first fruit setting was observed in G_5T_1 (46.66days) (Table 7). Days to first fruit setting showed reduction under salinity condition. The shortest days to first fruit setting was found in G_2 (-4.07%) under T_2 salinity treatment and whereas G_5 genotypes under T_2 delayed (-24.440%) (Appendix V and Figure 2).

4.1.7 Number of fruit per plant

Ten genotypes of chilli showed statistically significant variation under salinity treatments (Appendix IV). The maximum number of fruits per plant (37.11) was found in G_{10} whereas the minimum number of fruits per plant (12.22) was found in G_4 which was identical G_7 (12.22) (Table 8).

The number fruits per plant showed significant variation among the salinity treatments (Appendix IV). The lowest number of fruits per plant (10.10) was found in T_3 treatment while the highest number of fruit (18.53) was found in T_1 treatment (Table 9). The data showed that number of fruits per plant decreased with the increase of salinity level.

Number of fruit per plant was affected significantly by interaction among the chili genotypes and salinity level (Appendix IV). The maximum number of fruits per plant (64.00) was found in $G_{10}T_1$ whereas G_7T_3 (5.66) produced minimum number of fruits per plant (Table 10).

Significant reduction was found among genotypes with the increase of salinity level (Appendix V and Figure 3). The maximum reduction (81.82%) was found in G_8 under T_3 treatment whereas the minimum reduction (24.20%) was found in G_1 under T_2 treatment.

Table 8. Performance of chilli genotypes on Number of fruits per plant, length of fruit and fruit diameter

Genotype	Number of fruit per plant	Length of fruit (mm)	Fruit diameter (mm)
G_1	16.55 e	42.66 c	7.16 h
G_2	18.33 e	43.68 bc	7.56 g
G_3	23.78 cd	38.42 cde	9.45 b
G_4	12.22 f	32.24 e	8.32 d
G_5	30.55 b	49.66 b	7.72 f
G_6	18.11 e	39.28 cd	8.48 c
G_7	12.22 f	22.60 f	9.74 a
G_8	26.33 c	35.95 de	8.01 e
G_9	21.55 d	59.73 a	6.74 i
G_{10}	37.11 a	44.13 bc	7.59 fg
CV%	13.48	16.30	1.67
LSD (0.05)	2.76	6.28	0.13

Ten chilli genotypes coded from G_1 to G_{10}

In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Table 9. Performance of salinity treatments on Number of fruits per plant, length of fruit and fruit diameter

Salinity treatments	Number of fruit per plant	Length of fruit (mm)	Fruit diameter (mm)
T_1	18.53 b	48.41 a	9.80 a
T_2	10.10 c	39.20 b	7.66 b
T_3	10.10 c	34.90 c	6.77 c
CV%	13.48	16.30	1.67
LSD(0.05)	1.51	3.44	0.07

Three salinity treatments viz. T_1, Control; T_2, 4 dS/m; T_3, 8dS/m;.

In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability No. of fruit/plant

Table 10. Interaction effect of chilli genotypes and salinity treatments on Number of fruits perplant, length of fruit and fruit diameter

Interaction	Number of fruit per plant	Length of fruit (mm)	Fruit diameter (mm)
G_1T_1	20.66 fghi	57.66 ab	7.91 h
G_1T_2	15.66 jkl	36.80 fghijk	6.89 op
G_1T_3	13.33 klm	33.53 ghijkl	6.67 pq
G_2T_1	27.66 e	49.73 bcde	8.64 f
G_2T_2	15.66 jkl	44.13 cdefg	7.58 jk
G_2T_3	11.66 lmno	37.20 fghijk	6.48 qr
G_3T_1	45.00 c	49.26 bcde	12.64 a
G_3T_2	18.00 hijk	34.60 fghijkl	8.31 g
G_3T_3	8.33 nop	31.40 ijklm	7.40 kl
G_4T_1	19.66 ghij	42.06 defghi	10.00 c
G_4T_2	10.00 mnop	27.86 jklmn	7.68 ij
G_4T_3	7.00 op	26.80 klmn	7.28 lm
G_5T_1	55.00 b	53.93 bc	9.61 d
G_5T_2	24.33 efg	52.20 bcd	7.14 mn
G_5T_3	12.33 lmn	42.86 defgh	6.40 r
G_6T_1	24.66 ef	44.60 cdef	10.40 b
G_6T_2	17.33 ijk	40.53 efghi	7.82 hi
G_6T_3	12.33 lmn	32.73 hijklm	7.24 lm
G_7T_1	22.66 fgh	25.40 lmn	12.64 a
G_7T_2	8.33 nop	21.93 mn	9.193 e
G_7T_3	5.66 p	20.46 n	7.39 kl
G_8T_1	47.66 c	41.60 defghi	9.48 d
G_8T_2	22.66 fgh	34.86 fghijkl	7.58 jk
G_8T_3	8.66 mnop	31.40 ijklm	6.99 no
G_9T_1	37.00 d	67.73 a	7.89 hi
G_9T_2	17.66 ijk	57.06 ab	6.60 qr
G_9T_3	10.00 mnop	54.40 bc	5.72 t
$G_{10}T_1$	64.00 a	52.13 bcd	8.77 f
$G_{10}T_2$	35.66 d	42.00 defghi	7.87 hi
$G_{10}T_3$	11.66 lmno	38.26 fghij	6.14 s
CV%	13.48	16.30	1.67
LSD (0.05)	4.78	10.87	0.22

Ten genotypes coded from G_1 to G_{10} three salinity treatments viz. T_1, Control; T_2, 4dS/m; T_3,8dS/m.

In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

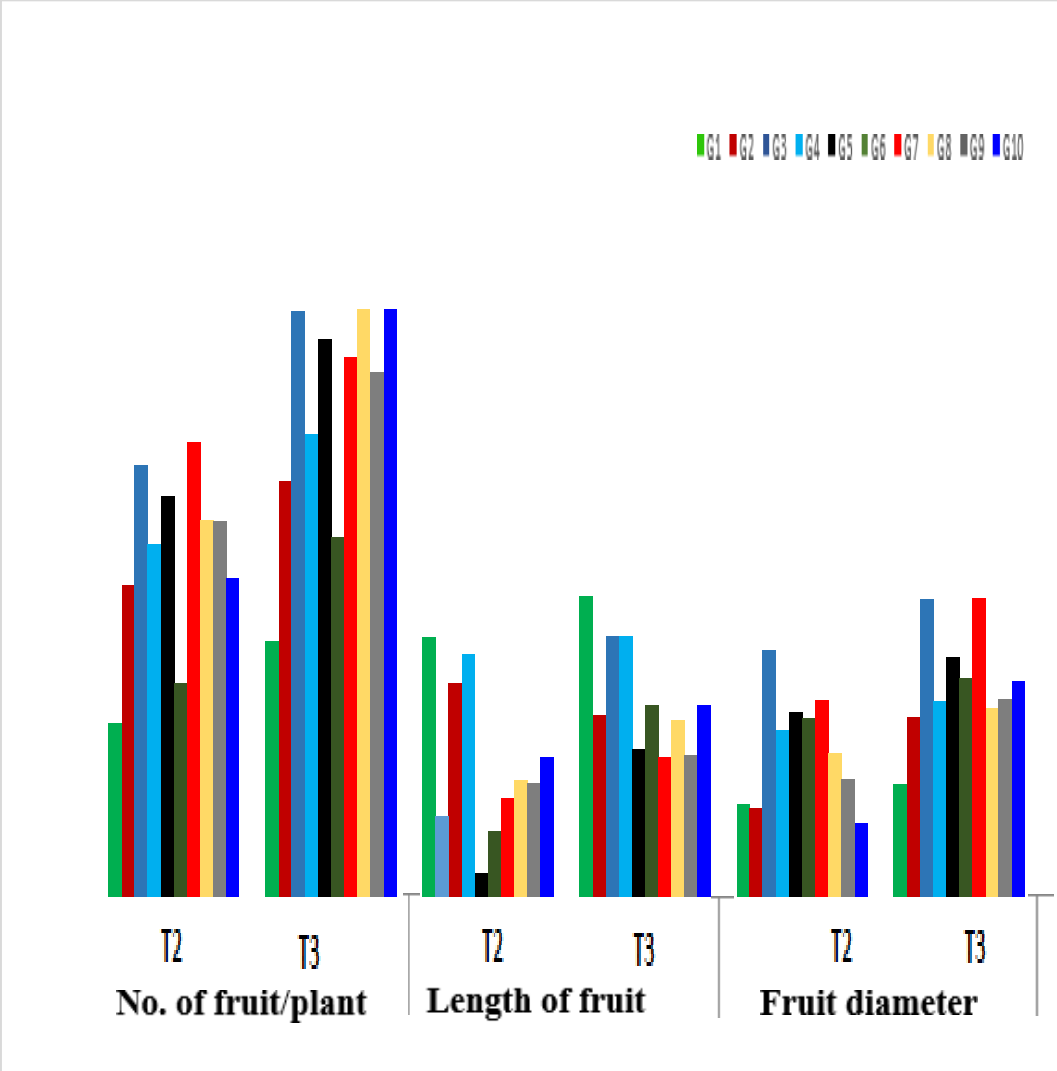

Figure 3. Reduction percentage in No. of fruit /plant, length of fruit and diameter of fruit under increasing salinity

4.1.8 Length of fruit (mm)

Ten genotypes of chilli showed statistically significant variation under salinity condition in term of fruit length (Appendix IV). The maximum fruit length (59.73 mm) was found in G_9 whereas the minimum fruit length (22.60 mm) was found in G_7 (Table 8).

Fruit length showed significant variation among salinity treatment (Appendix IV). The lowest fruit length (34.90 mm) was found in T_3 treatment while the highest fruit length (48.41mm) was found in T_1 treatment (Table 9).

Statistical no significant variation was found among the interaction of chilli genotypes and salinity treatment (Appendix IV). The maximum fruit length (67.73 mm) was found in G_9T_1 whereas the minimum fruit length in G_7T_3 (20.46 mm) (Table 10).

Significant reduction was observed in case of fruit length under salinity level (Appendix V and Figure 3). The maximum reduction percentage (41.84%) was found in G_1 under T_3 treatment and minimum reduction percentage (9.12%) was found in G_6 under T_2 treatment.

4.1.9 Fruit diameter (mm)

Fruit diameter showed statistically significant variation among ten chili genotypes (Appendix IV). The highest fruit diameter (9.74 mm) was found in G_7 while the lowest fruit diameter (7.16 mm) was found in G_1 (Table 8). Fruit diameter showed statistical significant variation among salinity treatments (Appendix IV).

The highest fruit diameter (9.8mm) was found in T_1 treatment while the lowest fruit diameter (6.77 mm) was found in T_3 treatment (Table 9). It was found that with the increase of salinity level, fruit diameter reduced.

Fruit diameter showed statistically significant variation in term of interaction among genotypes and salinity levels (Appendix IV). The highest fruit diameter (12.64 mm) was found in G_7T_1 whereas the lowest fruit diameter (5.72 mm) was found in G_9T_3 (Table 10).

Fruit diameter showed reduction with the increase of salinity level (Appendix IV and Figure 3). The maximum reduction (41.53%) was found in G_7 under T_3 treatment whereas the minimum reduction (10.26%) was found in G_{10} under T_2 treatment

4.1.10 Average fruit weight (g)

Ten genotypes of chili showed statistically significant variation in terms of average fruit weight (Appendix IV). The maximum average fruit weight (1.5 g) was found in G_3 whereas the minimum average fruit weight (0.85g) was found in G_1 (Table 11). Average fruit weight showed significant variation among salinity treatments (Appendix IV). The highest average (1.71 g) was found in T_1 Treatment while the lowest average fruit weight (0.74 g) was found in T_3 treatment (Table 12). This table showed that average fruit weight was reduced with the increase of salinity Average fruit weight showed significant variation among the interaction of chili genotypes and salinity treatments (Appendix IV). The highest average fruit weight (2.75 g) was found in G_3T_1 and the lowest average fruit weight (0.60 g) was found in $G_{10}T_2$ (Table 13). Significant reduction was found in chili genotypes under salinity condition Appendix IV and Figure 4). Highest reduction percentage (76.31) was found in G_{10} under T_3 and lowest reduction (26.49) was found in G_9 under T_2 treatment.

Table 11. Performance of chilli genotypes on average fruit, weight and yield per plant and root length

Genotype	Average fruit weight (g)	Yield per plant (g/plant)	Root length (cm)
G_1	0.85 f	8.57 g	16.33 cd
G_2	1.24 b	27.13 b	11.74 e
G_3	1.50 a	20.98 cd	18.33 b
G_4	1.24 b	18.21 e	11.26 e
G_5	1.01 e	22.07 cd	15.76 cd
G_6	1.12 cd	23.05 c	16.28 cd
G_7	1.11 d	14.73 f	28.10 a
G_8	0.96 e	20.32 de	12.06 e
G_9	1.17 c	20.98 cd	16.75 c
G_{10}	0.98 e	33.97 a	15.04 d
CV%	5.46	12.97	9.05
LSD (0.05)	0.06	2.57	1.38

Ten chilli genotypes coded from G_1 to G_{10}

In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

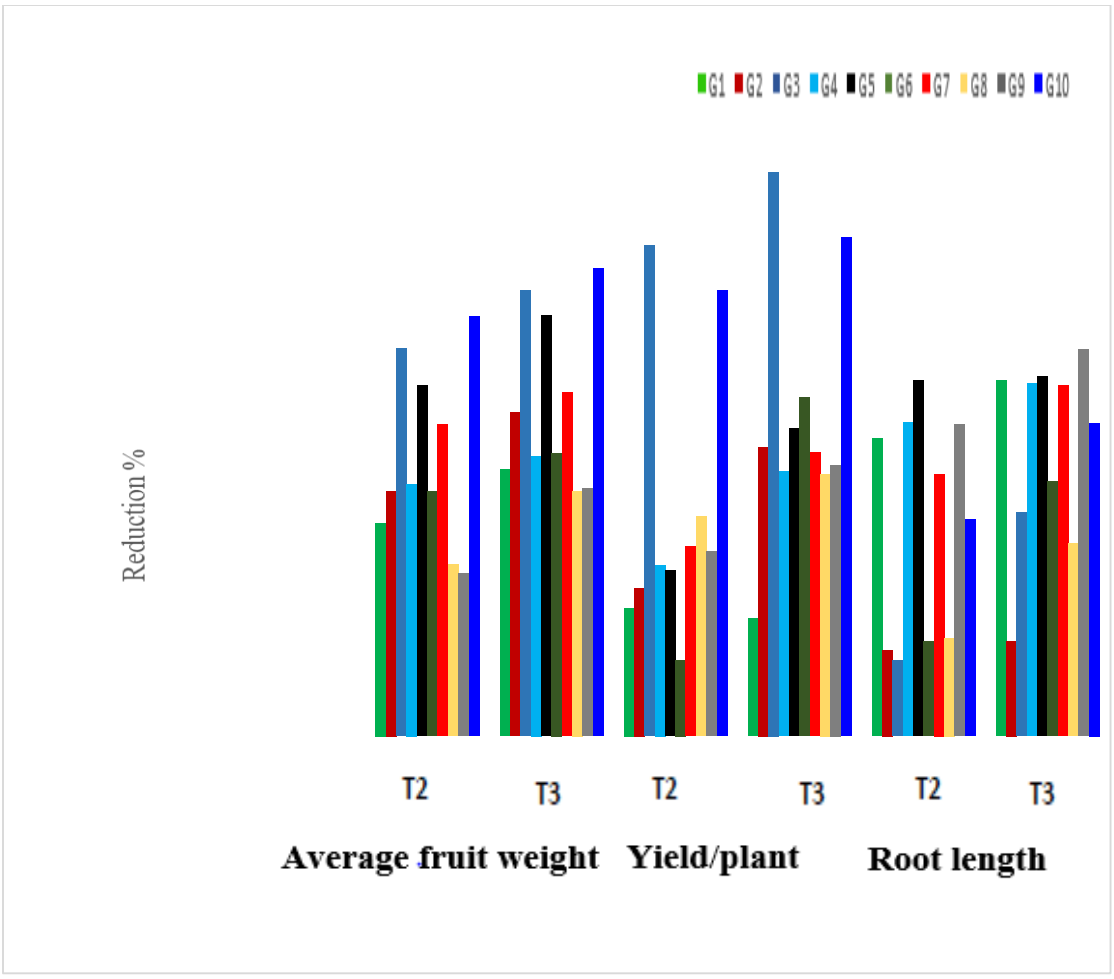

Figure 4. Reduction percentage in average fruit weight, yield/plant, and root length under increasing salinity

Table 12. Performance of salinity treatments on average fruit weight, yield per plant and root length

Salinity treatments	Average fruit weight (g	Yield per plant (Kg/plant)	Root length (cm)
T_1	1.71 a	32.31 a	22.84 a
T_2	0.90 b	17.96 b	14.30 b
T_3	0.74 c	12.74 c	11.36 c
CV%	5.46	12.97	9.05
LSD (0.05)	0.03	1.41	0.75

Three salinity treatments viz. T_1, Control; T_2, 4 dS/m; T_3, 8dS/m;
In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Table 13. Interaction effect of chilli genotypes and salinity treatments on average fruit weight, yield per plant and root length

Interaction	Average fruit weight (g)	Yield/plant (g/plant	Root length (cm)
G_1T_1	1.15 ef	9.90 no	25.33 bc
G_1T_2	0.75 jk	7.83 op	13.03 ijkl
G_1T_3	0.65 kl	8.00 op	10.63 mn
G_2T_1	1.80 bc	35.60 c	21.13 ef
G_2T_2	1.08 fg	27.00 de	13.66 ij
G_2T_3	0.85 ij	18.80 hij	10.33 mn
G_3T_1	2.75 a	49.20 b	13.03 ijkl
G_3T_2	1.01 gh	9.83 no	11.20 klm
G_3T_3	0.75 jk	3.93 p	11.00 klmn
G_4T_1	1.75 c	23.86 efg	21.90 de
G_4T_2	1.03 gh	17.20 ijkl	19.20 fgh
G_4T_3	0.95 hi	13.56 klmn	13.90 ij
G_5T_1	1.75 c	29.73 d	17.66 h
G_5T_2	0.75 jk	21.70 fgh	8.63 no
G_5T_3	0.55 lm	14.80 jklm	7.50 o
G_6T_1	1.58 d	29.76 d	25.80 bc
G_6T_2	0.95 hi	26.06 def	10.83 lmn
G_6T_3	0.85 ij	13.33 klmn	10.66 lmn
G_7T_1	1.73 c	19.83 ghi	20.10 efg
G_7T_2	0.85 ij	13.70 klmn	17.00 h
G_7T_3	0.76 j	10.66 mno	11.76 jklm
G_8T_1	1.25 e	27.53 de	42.13 a
G_8T_2	0.90 i	17.66 hijk	24.13 cd
G_8T_3	0.75 jk	15.76 ijkl	18.03 gh
G_9T_1	1.51 d	27.90 de	14.33 i
G_9T_2	1.11 fg	19.50 ghi	12.03 ijklm
G_9T_3	0.90 i	15.56 ijkl	9.83 mno
$G_{10}T_1$	1.90 b	69.83 a	27.03 b
$G_{10}T_2$	0.60 l	19.10 hij	13.26 ijk
$G_{10}T_3$	0.45 m	13.00 lmn	9.96 mn
CV%	5.46	12.97	9.05
LSD (0.05)	0.10	4.45	2.39

Ten genotypes coded from G_1 to G_{10} three salinity treatments viz. T_1, Control; T_2, 4dS/m; T_3,8dS/m.
In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

4.1.11 Yield per plant (g/Plant)

Ten chili genotypes showed statistically significant variation in term of yield per plant (Appendix IV). The highest yield (33.97 g/Plant) was found in G_{10} whereas the lowest yield was (8 g/plant) in G_1 (Table 11). Yield per plant showed statistically significant variation among different salinity treatments (Appendix IV).

The highest yield (32.31 g/plant) was found in T_1 treatment whereas the lowest yield (12.74 g/plant) was found in T_3 treatment (Table 12). It was found that yield per plant was reduced with the increase of salinity.

Yield reduced with the increase of salinity due to the reduction of number of leaves per plant, number of fruits per plant, average fruit weight and dropping of flowers and fruits with the increase of salinity., Rahim *et al.,* (2013) found same result under salinity condition.

Yield per plant showed statistically significant variation among the interaction of Chili genotypes and salinity condition (Appendix IV). The lowest yield per plant (3.93 g/plant) was found in G_3T_3 whereas the highest yield per plant (69.83 g/plant) was found in $G_{10}T_1$ (Table13).

Significant reduction was observed among the yield of genotypes under increasing salinity treatment (Appendix V and Figure 4). The highest reduction was (92.01) was found in G_3 under T_3 treatment whereas the lowest reduction (12.43) was found in G_6 under T_2 treatment.

4.1.12 Root length (cm)

Ten genotypes of chilli showed statistically significant variation in terms of root length (Appendix IV). The highest root length (28.10cm) was found in G_7 whereas the lowest root length (11.326 cm) was found in G4). which was statistically similar to G_2 (11.76 cm) and G_8 (12.06 cm) (Table 11). Root length showed statistically significant variation among the salinity treatments (Appendix IV). The highest root length (22.84 cm) was found in T_1 treatments whereas the lowest root length (11.36 cm) was found in T_3 treatment (Table 12). Water unavailability reduced the root length growth. Root length showed significant variation among the interaction between chili genotypes and salinity treatments (Appendix IV). The maximum root length (42.13cm) was found in G_8T_1 whereas the minimum root

length (7.5 cm) was found in G_5T_3 (Table 13). Root length showed significant reduction under different salinity levels (Appendix V and Figure 6). The maximum reduction percentage (63.11) in G_9 under T_3 treatmen whereas the minimum reduction percentage (12.32%) was found in G_3 under T_2 treatment.

4.1.2 Physiological traits

The physiological traits are ethylene concentration, % Membrane Stability Index, Chlorophyll content, relative water content, % Moisture content, % Dry matter content, Na+content and K+ content. Here discussed only chlorophyll content and relative water content. ANOVA is presented in Appendix IV and data are presented in figures and graph. Reduction percentage is presented in Appendix V.

4.2.1 Chlorophyll content

Ten genotypes showed statistically significant variation in term of chlorophyll content (Appendix IV). The maximum chlorophyll content (69.55) was found in G_6 which statistically similar to G_4 (66.88%) whereas the minimum chlorophyll content (46.44) was found in G_8 genotypes (Table 14). Chlorophyll content showed statistically significant among the treatments (Appendix IV). The highest chlorophyll content (66.10 %) was found in T_1 treatment which statistically similar to (62.14%) to T_2 treatment whereas the lowest chlorophyll content (47.58 %) was found in T_3 salinity treatments (Table 15). The table showed that chlorophyll content decreased with the increase of salinity treatments. Chlorophyll content showed statistically significant variation among the interaction of genotypes and treatments (Appendix VI). The highest chlorophyll content was found in G_6T_1 (83.00%) whereas the lowest chlorophyll content was found in G_3T_3 (29.00%) (Table 16). Genotypes showed significant reduction in chlorophyll content under increasing salinity treatments (Appendix VII and Figure 5). The maximum reduction percentage was found in G_3 (63.75 %) under T_3 whereas the minimum reduction was found in G_9 (-32.3%) under T_2 treatment

4.2.2 Relative Water Content

Genotypes of chilli showed statistical significant variation in term of relative water content (Appendix IV). The highest relative water content (80%) was found in G_1 and lowest relative waer content was G_{10} (45.81%) (Table 14). Relative water content showed statistically significant variation among salinity treatments (Appendix IV). The highest relative water content (71.57%) was found in T_1 and the lowest (47.58 %) was found in T_3 treatment (Table 15).

Table 14. Performance of chilli genotypes on chlorophyll content and relative water content

Genotype X	Chlorophyll content (%)	Relative water content
G_1	65.98 ab	80.40 a
G_2	63.22 abc	72.55 b
G_3	53.00 bcd	60.46 e
G_4	66.88 a	68.72 c
G_5	50.88 cd	59.20 e
G_6	69.55 a	52.87 g
G_7	51.33 cd	49.76 h
G_8	46.44 d	64.20 d
G_9	58.11 abcd	54.56 f
G_{10}	60.66 abc	45.81 i
CV%	24.34	2.50
LSD (0.05)	13.454	1.4324 TO 1.4908

Ten chilli genotypes coded from G_1 to G_{10}

In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

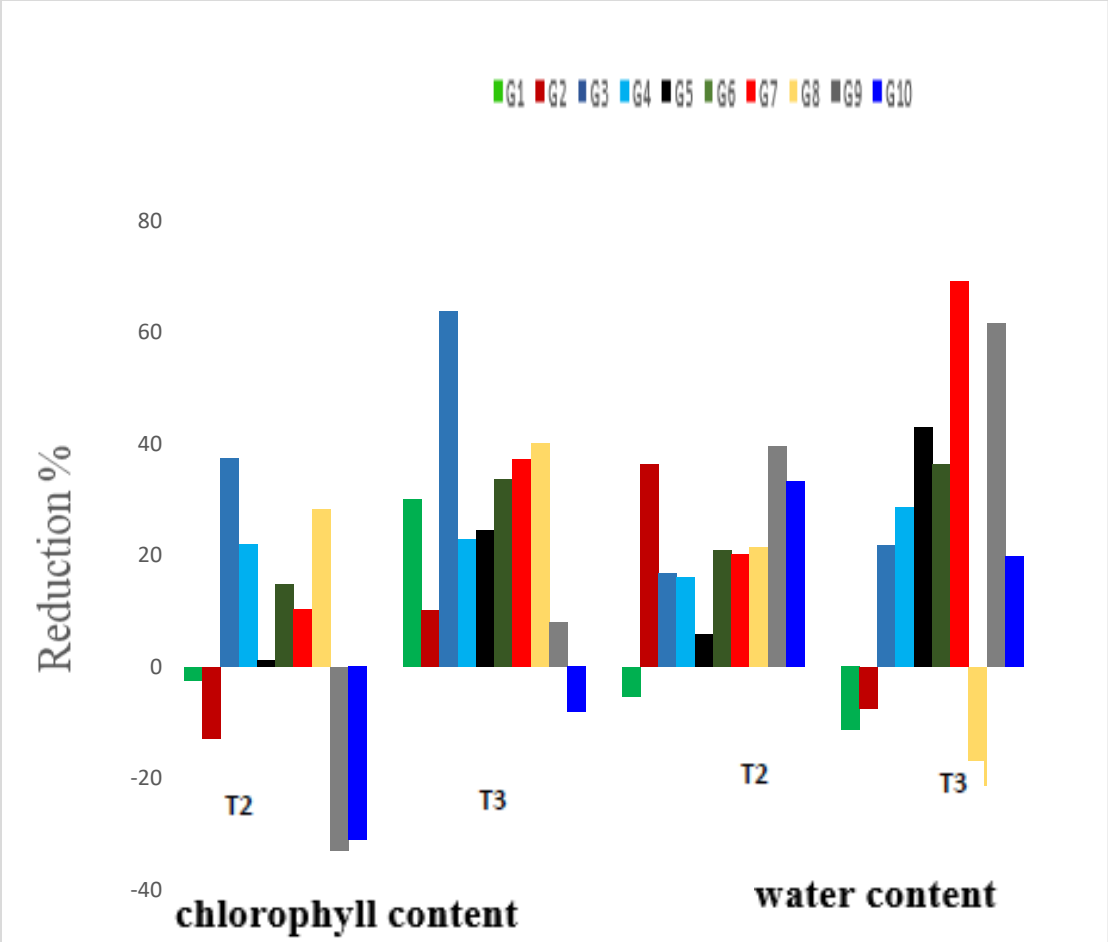

Figure 5. Reduction percentage in chlorophyll content and relative water content under increasing salinity

Table 15. Performance of salinity treatments on chlorophyll content and relative water content

Salinity treatments	Chlorophyll content (%)	Relative water content
T_1	66.10 a	71.57 a
T_2	62.14 a	56.90 b
T_3	47.58 b	54.09 c
CV%	24.34	2.50
LSD (0.05)	7.3692	0.7845 to 0.7943

Three salinity treatments viz. T_1, Control; T_2, 4 dS/m; T_3, 8dS/m;
In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Table 16. Interaction effect of chilli genotypes and salinity treatments on chlorophyll content and relative water content

Interaction	Chlorophyll content (%)	Relative water content
G_1T_1	72.66 abcde	76.18 e
G_1T_2	74.43 abcd	80.21 cd
G_1T_3	50.86 efghij	84.80 ab
G_2T_1	62.66 abcdefg	80.28 cd
G_2T_2	70.66 abcdef	51.13 l
G_2T_3	56.33 cdefghi	69.36 fg
G_3T_1	80.00 ab	86.25 a
G_3T_2	50.00 efghij	57.77 j
G_3T_3	29.00 j	54.25 k
G_4T_1	78.66 abc	80.73 c
G_4T_2	61.33 abcdefgh	67.73 gh
G_4T_3	60.66 abcdefgh	57.69 j
G_5T_1	55.66 cdefghi	70.69 f
G_5T_2	55.00 defghi	66.59 hi
G_5T_3	42.00 ghij	40.32 n
G_6T_1	83.00 a	65.33 hi
G_6T_2	70.66 abcdef	51.65 l
G_6T_3	55.00 defghi	41.63 n
G_7T_1	61.00 abcdefgh	70.90 f
G_7T_2	54.66 defghi	56.55 jk
G_7T_3	38.33 hij	21.83 q
G_8T_1	60.00 abcdefgh	64.25 i
G_8T_2	43.00 ghij	50.42 l
G_8T_3	36.33 ij	77.94 de
G_9T_1	53.66 defghi	82.34 bc
G_9T_2	71.33 abcdef	49.77 l
G_9T_3	49.33 fghij	31.59 p
$G_{10}T_1$	53.66 defghi	55.66 jk
$G_{10}T_2$	70.33 abcdef	37.15 o
$G_{10}T_3$	58.00 bcdefghi	44.62 m
CV%	24.34	2.50
LSD (0.05)	23.303	2.4809 TO 2.7737

Ten genotypes coded from G_1 to G_{10} three salinity treatments viz. T_1, Control; T_2, 4dS/m; T_3,8dS/m.
In a column means having similar letter (s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

It was showed that relative water content decreased with the increase of salinity level. Due to physiological drought caused by salinity treatment water uptake is reduced and result in

reduction in relative water content.

Relative water content showed significant variation among the interaction of salinity and genotypes (Appendix IV). The highest relative water content (86.25%) was found in G_3T_1 whereas the lowest relative water content (37.15%) was found in $G_{10}T_2$(Table 16). Significant reduction was found among the genotypes under different level of salinity in case of relative water content (Appendix V and Figure 8). The maximum reduction (69.21%) was found in G_7 under T_3 treatment whereas the minimum reduction (-21.30%) was found in G_8 under T_3 treatment.

4.3 Genetic variability, heritability, genetic advance and genetic advance in percentage of mean

4.3.1 Days to first flowering

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (109.03 for T_1 treatment), (108.20 for T_2 treatment) and (111.02 for T_3 treatment) and the genotypic variance was (107.66 for T_1 treatment), (106.83 for T_2 treatment), and (109.65 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (21.04 for T_1 treatment), (19.05 for T_2 treatment), (21.89 for T_3 treatment) and genotypic coefficient of variation were (20.91 for T_1 treatment), (18.93 for T_2 treatment), (21.75 for T_3 treatment) that indicates presence of variability in this trait. (Table 17).

High heritability (98.74 for T_1 treatment), (98.73 for T_2 treatment), (98.77 for T_3 treatment) coupled with high genetic advance (21.24 for T_1 treatment), (21.16 for T_2 treatment), (21.44 for T_3 treatment) and genetic advance in percentage of mean (42.79 for T_1 treatment), (38.75 for T_2 treatment), (44.54 for T_3 treatment) that indicates this character is controlled by additive gene action and it may be improved by direct selection. (Table 17).

4.3.2 Days to first fruit setting

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (105.35 for T_1 treatment), (104.16 for T_2 treatment) and (105.94 for T_3 treatment) and the genotypic variance was (103.22 for T_1 treatment), (102.03 for T_2 treatment) and (103.81 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (17.25 for T_1 treatment), (15.54 for T_2 treatment), (14.90 for T_3 treatment) and genotypic coefficient of variation were (17.08 for T_1 treatment), (15.38 for T_2 treatment), (14.74 for T_3 treatment) that indicates presence of variability in this trait. (Table 17).

High heritability (97.98 for T_1 treatment), (97.95 for T_2 treatment), (97.99 for T_3 treatment) coupled with high genetic advance (20.72 for T_1 treatment), (20.59 for T_2 treatment), (20.78 for T_3 treatment) and genetic advance in percentage of mean (34.82 for T_1 treatment), (31.36 for T_2 treatment), (30.07 for T_3 treatment) that indicates this character is controlled by additive gene action and it may be improved by direct selection. (Table 17).

4.3.3 Plant height (cm)

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (154.01 for T_1 treatment), (156.86 for T_2 treatment) and (153.03 for T_3 treatment) and the genotypic variance was (148.32 for T_1 treatment), (151.17 for T_2 treatment) and (147.34 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (23.53 for T_1 treatment), (24.40 for T_2 treatment), (24.68 for T_3 treatment) and genotypic coefficient of variation were (23.10 for T_1 treatment), (23.95 for T_2 treatment), (24.21 for T_3 treatment) that indicates presence of variability in this trait. (Table 17).

High heritability (96.31 for T_1 treatment), (96.37 for T_2 treatment), (96.28 for T_3 treatment) coupled with high genetic advance (24.62 for T_1 treatment), (24.86 for T_2 treatment), (24.54 for T_3 treatment) and genetic advance in percentage of mean (46.69 for T_1

treatment), (48.44 for T_2 treatment), (48.94 for T_3 treatment) that indicates this character is controlled by additive gene action and it may be improved by direct selection. (Table 17).

4.3.4 Root length (cm)

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (160.93 for T_1 treatment), (113.84 for T_2 treatment) and (100.94 for T_3 treatment) and the genotypic variance was (67.54 for T_1 treatment), (20.45 for T_2 treatment) and (7.55 for T_3 treatment) indicates that there was large environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (55.52 for T_1 treatment), (74.61 for T_2 treatment), (88.42 for T_3 treatment) and genotypic coefficient of variation were (35.97 for T_1 treatment), (31.63 for T_2 treatment), (24.18 for T_3 treatment) that indicates presence of variability in this trait. (Table 17).

Medium heritability (41.97 for T_1 treatment), low heritability (17.97 for T_2 treatment) and low heritability (96.28 for T_3 treatment) coupled with medium genetic advance (10.97 for T_1 treatment), low genetic advance (3.95 for T_2 treatment), low genetic advance (1.55 for T_3 treatment) and genetic advance in percentage of mean (48 for T_1 treatment), (27.62 for T_2 treatment), (13.62 for T_3 treatment) that indicates this character is controlled by non-additive gene action and it may not be improved by direct selection. (Table 17).

4.3.5 No. of branches/plant

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (4.42 for T_1 treatment), (2.78 for T_2 treatment) and (3.43 for T_3 treatment) and the genotypic variance was (1.85 for T_1 treatment), (0.21 for T_2 treatment) and (0.86 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (26.50 for T_1 treatment), (28.28 for T_2 treatment), (42.71 for T_3 treatment) and genotypic coefficient of variation were (17.14 for T_1 treatment), (7.86 for T_2 treatment), (21.35 for T_3 treatment) that indicates presence of

variability in this trait. (Table 17).

Medium heritability (41.83 for T_1 treatment), low heritability (7.71 for T_2 treatment), high heritability (24.98 for T3 treatment) coupled with low genetic advance (1.81 for T_1 treatment), (0.27 for T_2 treatment), (0.95 for T3 treatment) and high genetic advance in percentage of mean (22.83 for T_1 treatment), (4.49 for T_2 treatment), (21.98 for T_3 treatment) that indicates this character is controlled by non-additive gene action and it may not be improved by direct selection. (Table 17).

4.3.6 Number of leaves per plant

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (13209.71 for T_1 treatment), (4182.98 for T_2 treatment) and (1568.07 for T_3 treatment) and the genotypic variance was (13209.23 for T_1 treatment), (4182.50 for T_2 treatment) and (1567.59 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (31.63 for T_1 treatment), (29.97 for T_2 treatment), (27.07 for T_3 treatment) and genotypic coefficient of variation were (31.63 for T_1 treatment), (29.97 for T_2 treatment), (27.06 for T_3 treatment) that indicates presence of less variability in this trait. (Table 17).

High heritability (100 for T_1 treatment), (99.99 for T_2 treatment), (99.97 for T_3 treatment) coupled with high genetic advance (236.75 for T_1 treatment), (133.22 for T_2 treatment), (81.55 for T_3 treatment) and genetic advance in percentage of mean (65.15 for T_1 treatment), (61.74 for T_2 treatment), (55.74 for T_3 treatment) that indicates this character is controlled by additive gene action and it may be improved by direct selection. (Table 17).

4.3.7 Leaf area(cm^2)

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (33.88 for T_1 treatment), (34.51 for T_2 treatment) and (39.91 for T_3 treatment) and the genotypic variance was (33.09 for T_1 treatment), (33.73 for T_2 treatment) and (39.13 for T_3 treatment) indicates that there was little environmental effect for this trait.

(Table 17).

Both the phenotypic coefficient of variation (19.79 for T_1 treatment), (29.56 for T_2 treatment), (33.66 for T_3 treatment) and genotypic coefficient of variation were (19.56 for T_1 treatment), (29.22 for T_2 treatment), (33.33 for T_3 treatment) that indicates presence of less variability in this trait. (Table 17).

High heritability (97.67 for T_1 treatment), (97.72 for T_2 treatment), (98.03 for T_3 treatment) coupled with medium genetic advance (11.71 for T_1 treatment), (11.83 for T_2 treatment), (12.76 for T_3 treatment) and high genetic advance in percentage of mean (39.83 for T_1 treatment), (59.50 for T_2 treatment), (67.98 for T_3 treatment) that indicates this character is controlled by additive and non-additive gene action and it may be improved by direct selection. (Table 17).

4.3.8 Length of fruit (mm)

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (7632.79 for T_1 treatment), (7620.03 for T_2 treatment) and (7597.07 for T_3 treatment) and the genotypic variance was (110.19 for T_1 treatment), (97.43 for T_2 treatment), and (74.47 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (180.46 for T_1 treatment), (222.69 for T_2 treatment), (249.70 for T_3 treatment) and genotypic coefficient of variation were (21.68 for T_1 treatment), (25.18 for T_2 treatment), (24.72 for T_3 treatment) that indicates presence of variability in this trait. (Table 17).

Low heritability (1.44 for T_1 treatment), (1.28 for T_2 treatment), (0.98 for T_3 treatment) coupled with low genetic advance (2.60 for T_1 treatment), (2.30 for T_2 treatment), (1.76 for T_3 treatment) and genetic advance in percentage of mean (5.37 for T_1 treatment), (5.87 for T_2 treatment), (5.04 for T_3 treatment) that indicates this character is controlled by non-additive gene action and it may not be improved by direct selection. (Table 17).

4.3.9 Fruit diameter (mm)

Phenotypic variance was higher than the genotypic variance for all the characters in three

treatments under the study. For the control and others two treatments the phenotypic variance was (3.01 for T_1 treatment), (0.63 for T_2 treatment) and (0.42 for T_3 treatment) and the genotypic variance was (2.92 for T_1 treatment), (0.54 for T_2 treatment), and (0.33 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (17.71 for T_1 treatment), (10.31 for T_2 treatment), (9.53 for T_3 treatment) and genotypic coefficient of variation were (17.44 for T_1 treatment), (9.54 for T_2 treatment), (8.44 for T_3 treatment) that indicates presence of variability in this trait. (Table 17).

High heritability (97.01 for T_1 treatment), (85.61 for T_2 treatment), (78.42 for T_3 treatment) coupled with low genetic advance (3.47 for T_1 treatment), (1.39 for T_2 treatment), (1.04 for T3 treatment) and medium genetic advance in percentage of mean (35.39 for T_1 treatment), (18.19 for T_2 treatment), (15.40 for T_3 treatment) that indicates this character is controlled by additive gene action and it may be improved by direct selection. (Table 17).

4.3.10 Number of fruit per plant

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (250.07 for T_1 treatment), (61.34 for T_2 treatment) and (10.21 for T_3 treatment) and the genotypic variance was (245.32 for T_1 treatment), (56.59 for T_2 treatment), and (5.46 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (43.44 for T_1 treatment), (42.26 for T_2 treatment), (31.63 for T_3 treatment) and genotypic coefficient of variation were (43.03 for T_1 treatment), (40.59 for T_2 treatment), (23.13 for T_3 treatment) that indicates presence of variability in this trait. (Table 17).

High heritability (98.10 for T_1 treatment), (92.26 for T_2 treatment), (53.46 for T_3 treatment) coupled with high genetic advance (31.96 for T_1 treatment), low genetic advance (14.88 for T_2 treatment), low genetic advance (3.52 for T_3 treatment) and high genetic advance in percentage of mean (87.79 for T_1 treatment), (80.31 for T_2 treatment), (34.83 for T_3 treatment) that indicates this character is controlled by additive gene action and it may be

improved by direct selection. (Table 17).

4.3.11 Yield per plant (g/plant)

Phenotypic variance was higher than the genotypic variance for all the characters in three treatments under the study. For the control and others two treatments the phenotypic variance was (273.65 for T_1 treatment), (37.37 for T_2 treatment) and (17.54 for T_3 treatment) and the genotypic variance was (273.62 for T_1 treatment), (37.34 for T_2 treatment), and (17.51 for T_3 treatment) indicates that there was little environmental effect for this trait. (Table 17).

Both the phenotypic coefficient of variation (51.19 for T_1 treatment), (34.04 for T_2 treatment), (32.86 for T_3 treatment) and genotypic coefficient of variation were (51.19 for T_1 treatment), (34.03 for T_2 treatment), (32.84 for T_3 treatment) that indicates presence of variability in this trait. (Table 17).

High heritability (99.99 for T_1 treatment), (99.92 for T_2 treatment), (99.83 for T_3 treatment) coupled with high genetic advance (34.07 for T_1 treatment), medium genetic advance (12.58 for T_2 treatment), low genetic advance (8.61 for T3 treatment) and high genetic advance in percentage of mean (105.44 for T_1 treatment), (70.06 for T_2 treatment), (67.59 for T_3 treatment) that indicates this character is controlled by additive gene action and it may be improved by direct selection. (Table 17).

Table 17. Estimation of genetic parameter for all characters of ten genotypes of chilli under T_1, T_2 and T_3 treatments

Characters	Treatments	σ_g^2	σ_p^2	GCV	PCV	h_b^2	GA	GAM (%)
Days to first flowering	T_1	107.66	109.03	20.91	21.04	98.74	21.24	42.79
	T_2	106.83	108.20	18.93	19.05	98.73	21.16	38.75
	T_3	109.65	111.02	21.75	21.89	98.77	21.44	44.54
Days to first fruit setting	T_1	103.22	105.35	17.08	17.25	97.98	20.72	34.82
	T_2	102.03	104.16	15.38	15.54	97.95	20.59	31.36
	T_3	103.81	105.94	14.74	14.90	97.99	20.78	30.07
Plant height (cm)	T_1	148.32	154.01	23.10	23.53	96.31	24.62	46.69
	T_2	151.17	156.86	23.95	24.40	96.37	24.86	48.44
	T_3	147.34	153.03	24.21	24.68	96.28	24.54	48.94
Root length (cm)	T_1	67.54	160.93	35.97	55.52	41.97	10.97	48.00
	T_2	20.45	113.84	31.63	74.61	17.97	3.95	27.62
	T_3	7.55	100.94	24.18	88.42	7.48	1.55	13.62
No. of branches/plant	T_1	1.85	4.42	17.14	26.50	41.83	1.81	22.83
	T_2	0.21	2.78	7.86	28.28	7.71	0.27	4.49
	T_3	0.86	3.43	21.35	42.71	24.98	0.95	21.98
Number of leaves per plant	T_1	13209.23	13209.71	31.63	31.63	100.00	236.75	65.15
	T_2	4182.50	4182.98	29.97	29.97	99.99	133.22	61.74
	T_3	1567.59	1568.07	27.06	27.07	99.97	81.55	55.74
Leaf area (cm^2)	T_1	33.09	33.88	19.56	19.79	97.67	11.71	39.83
	T_2	33.73	34.51	29.22	29.56	97.72	11.83	59.50
	T_3	39.13	39.91	33.33	33.66	98.03	12.76	67.98
Length of fruit (mm)	T_1	110.19	7632.79	21.68	180.46	1.44	2.60	5.37
	T_2	97.43	7620.03	25.18	222.69	1.28	2.30	5.87
	T_3	74.47	7597.07	24.72	249.70	0.98	1.76	5.04

Fruit diameter (mm)	T_1	2.92	3.01	17.44	17.71	97.01	3.47	35.39
	T_2	0.54	0.63	9.54	10.31	85.61	1.39	18.19
	T_3	0.33	0.42	8.44	9.53	78.42	1.04	15.40
Number of fruit per plant	T_1	245.32	250.07	43.03	43.44	98.10	31.96	87.79
	T_2	56.59	61.34	40.59	42.26	92.26	14.88	80.31
	T_3	5.46	10.21	23.13	31.63	53.46	3.52	34.83
Yield per plant (g/plant)	T_1	273.62	273.65	51.19	51.19	99.99	34.07	105.44
	T_2	37.34	37.37	34.03	34.04	99.92	12.58	70.06
	T_3	17.51	17.54	32.84	32.86	99.83	8.61	67.59

σ_p^2=Phenotypic varience, σ_g^2=Genotypic Varience, PCV=Phenotypic co efficient variation, GCV=Genotypic co efficient variation, h_b^2 = Heritability, GA=Genetic Advance, GAM (%)=Genetive advance in percentage of mean

CHAPTER V

SUMMARY AND CONCLUTION

The pot experiment was conducted for salt in net house, Department of Genetics and Plant Breeding, Sher-e-Bangla Agricultural University, Dhaka during November 2018 to April 2019. Salt experiment was conducted with Ten chili genotypes under three treatments viz, T_1 (control), T_2 (4 dS/m) and T_3 (8 dS/m) with CRD design with three replications. The experiments were evaluated based on agromorphogenic, physiological and nutritional traits. Data was analyzed with Statistic 10 software. ANOVA, reduction percentage, genotypes performance, genotype stress interaction was arranged in different table and graph.

In interaction of chili genotypes with salinity treatment, tallest plant was found in G_6T_1 (66.83 cm) whereas shortest plant was found in G_1 (30.16 cm) which was statistically similar with G_{10} (30.83cm). The highest reduction percentage was found in G_1 (9.42%) in T_3 treatment whereas the lowest reduction percentage was observed in G_6 (1.5%) under T_1 treatment in plant height. Maximum number of leaves were found in $G_{10}T_1$ (500.00) whereas the minimum number of laves were found in G_1T_3 (100.00) which was statistically similar with G_8T_2 (105). The maximum reduction in leaf number was found in G_8 T_3 (73.75%) whereas the minimum reduction was found in G_2 T_2 (18.71%). The maximum leaf area was found in G_7T_1 (37.73cm^2) which is similar to G_3T_1 (36.09) whereas lowest leaf area was found in G_8T_2 (9.98 Cm2) Which was similar to G_8T_3 (9.85) The maximum leaf area reduction was found in G_4T_3 (67.05%) in and minimum in G_1T_2 (16.33%). Number of branches was found highest in G_7T_1 (10.66)) and lowest in G_4T_3 (2.66). The maximum reduction in branch number was found in G_3T_3 (60.83%) and minimum in in G_6 T_2 (-12.57%). The early flowering was found in G_5T_1 (36.00 days and late flowering was found in G_7T_2 (66.66days). The maximum reduction was found in case of first flowering in G_1 T_3 (5.00%) in whereas the minimum reduction in G_9 T_2 (-29.47%). The longest time for first fruit setting was found in G_7T_3 (82.00days) and shortest time in G_5T_1 (46.66days. The maximum reduction in case of first fruit setting was found in G_5 T_2 (-24.440%) and minimum reduction was found in G_2 T_2 (-4.07%).

Number of fruit per plant was found maximum in $G_{10}T_1$ (64.00) and minimum in G_7T_3

(5.66). The fruit number reduction was maximum in G_3T_3 (92.01) and minimum in G_1T_2 (24.20%). Length of fruit was highest in G_9T_1 (67.73mm) and lowest in G_7T_3 (20.46 mm). The maximum reduction was found in G_1T_3 (41.84%) and lowest in G_6T_2 (9.12).

Fruit diameter was found highest in G_7T_1 (12.64 mm) and lowest in G_9T_3 (5.72 mm. the maximum reduction in fruit diameter was found in G_7T_3 (41.53and minimum in$G_{10}T_2$ (10.26%). Average fruit weight was found highest in G_3T_1 (2.75 g) and minimum fruit weight in $G_{10}T_2$ (0.60 g). The maximum weight reduction was found in $G_{10}T_3$ (76.31) and minimum in G_9T_2 (26.49). Yield per plant was found highest in $G_{10}T_1$ (69.83g / plant) which was whereas the lowest yield per plant was found in G3T3 (3.93 g/plant). The maximum reduction in yield was found in G_3T_3 (92.01) and lowest in G_6T_2 (12.43).

The highest root length was found in G_8T_1 (42.13cm) and lowest in G_5T_3 (7.5 cm)). The maximum reduction in root length was in G_9T_3 (63.11) and minimum in G_3T_2 (12.32%).

The highest chlorophyll content was found in G_6T_1 (83.00%) and lowest in G3T3 (29.00%)The maximum reduction was found in G_3 T_3 (63.75 %) and lowest in G_9 T_2 (-32.3%). RWC was highest in G_3T_1 (86.25%) and lowest in $G_{10}T_2$ (37.15%) The maximum reduction was found in 69.21%) G_7T_3 and minimum in G_8 T_3 (-21.30%). Phenotypic variance was higher than the genotypic variance for all the characters under all the treatments. Phenotypic co-efficient of variation and genotypic co-efficient of variation was high in all the characters except number of branches per plant under T_2 treatment and fruits diameter (mm) under T_2 and T_3 treatments. High heritability coupled with high genetic advance and genetic advance in percentage of mean was found in days to first flowering, days to first fruit setting, root length, number of leaves per plant under all the treatments indicated that this characters are controlled by the additive gene action and direct selection may be effective through this characters.

From the research findings of salinity experiment, the following could be recommended

- Considering the yield characters, genotype G_6, and G_9 could be recommended for moderate salinity stress; Genotype G_1 and G_8 could be recommended for prolonged and severe salinity stress.
- These genotypes could be recommended to the farmers for cultivation in the salinity prone areas of Bangladesh.
- Also these genotypes could be used in future hybridization programs.

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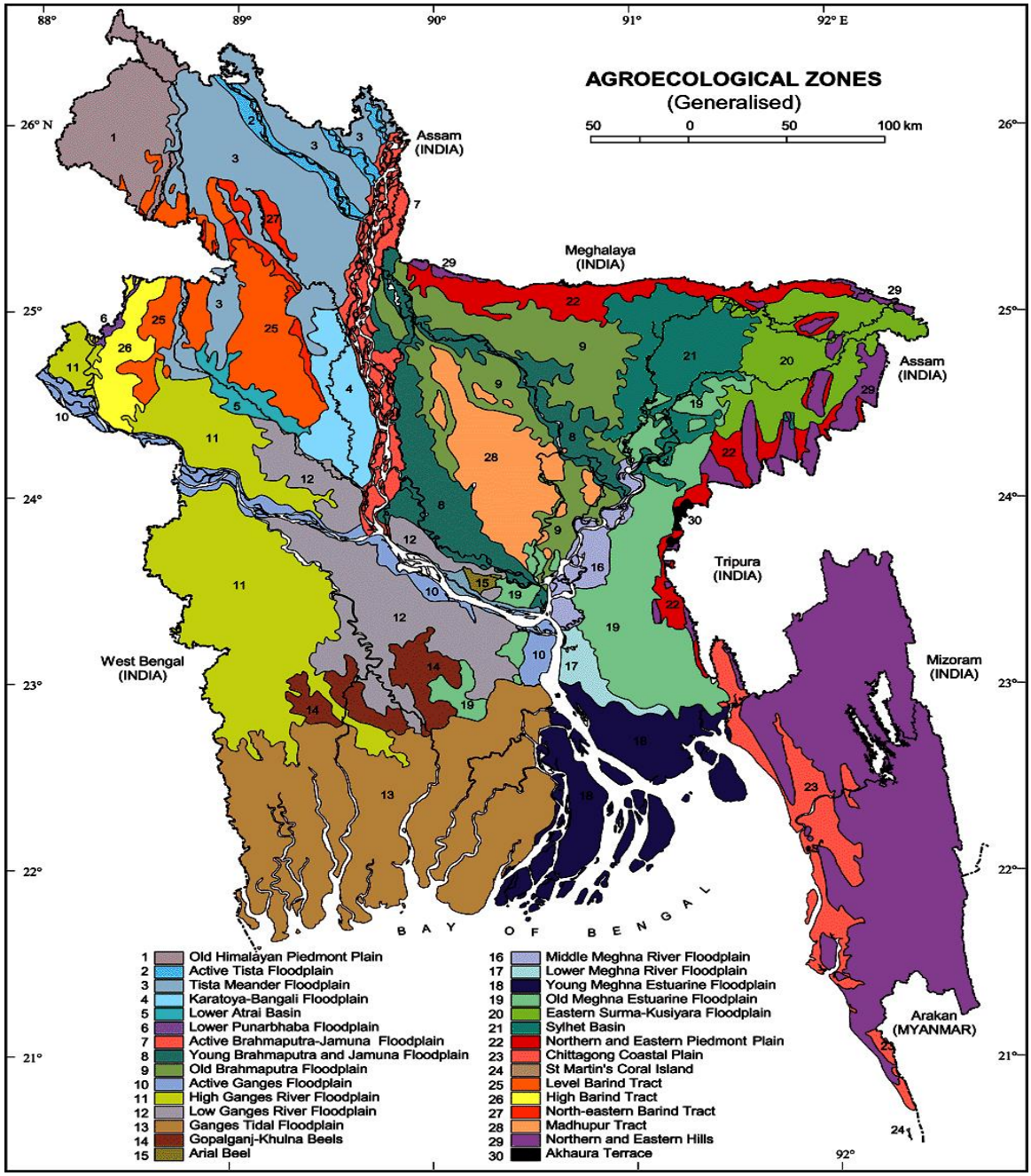
APPENDICES

Appendix I. Map showing the experimental site under the study



Legend showing the research site

Appendix II. Monthly records of air temperature, relative humidity, rainfall and sunshine hours during the period from November 2018 to March 2019

Month	Year	Monthly average air temperature (o C)			Average relative humidity (%)	Total ranfall (mm	Total sunshine (hours
		Maximm	Minimum	Mean			
Nov	2018	31	18	24	63	Trace	216.4
Dec	2018	27.12	19.34	19.34	61	Trace	212.50
Jan	2019	*2*8	10	14	65	Trace	212.50
Feb	2019	32	12	22	73.23	4.0	195.00
Mar	2019	34	*16*	25	67.23	4.5	225.50

Appendix III. The mechanical and chemical characteristics of soil of the experimental site as observed prior to experimentation (0 – 15 cm depth

Mechanical composition:	
Particle size	constitution
Sand	40%
Silt	40%
Clay	20%
Texture	Loamy
Chemical composition	
Soil characters	**Value**
Organic matter	1.44 %
Potassium	0.15 meq/100 g soil
Calcium	3.60 meq/100 g soil
Magnesium	1.00 meq/100 g soil
Total nitrogen	0.072
Phosphorus	22.08 µg/g soil
Sulphur	25.98 µg/g soil
Boron	0.48 µg/g soil
Copper	3.54 µg/g soil
Iron	262.6 µg/g soil
Manganese	164 µg/g soil\
Zinc	3.32 µg/g soil

Source: Soil Resources Development Institute (SRDI), Khamarbari, Dhaka

Appendix IV. Analysis of variance of the data on agromorphogenic, physiological and traits under Salinity treatments

Source of variation	Degrees of freedom (df	Mean Sum of Square						
		Plant height	No. of leaves /plant	No. of branches /plant	Leaf area	Days to first flowering	Days to first fruit setting	No. of fruit /plant
Factor A (Genotype)	9	1339.79**	36694**	9.68**	265.70**	960.26**	937.70**	572.06**
Factor B (Treatment)	2	50.80**	368768**	97.74**	1026.02**	343.68**	709.88**	5410.14**
A x B	18	0.36^{NS}	10464**	1.60*	35.09**	16.55*	9.12^{NS}	187.12**
Error	35	3.08	277	1.52	7.19	7.422	10.49	8.54

Singnificant at 0.05 level of probability **Significant at 0.01level of probality and NS Non-significant

Appendix IV. Cont'd

Source of variation	Degrees of freedom (df	Mean Sum of Square						
		Length of fruit	Diameter of fruit	**Average** fruit weight	Yield per plant	Root length	Chlorophyll Content	RWC
Factor A (Genotype	9	8062.7**	8.15**	0.30837**	413.25**	209.28**	560.58**	1038.46**
Factor B (Treatment	2	*2857*.5**	72.53**	.15735**	3082.21**	1067.68**	2851.48*	2560.93**
A x B	18	626.2 ^{NS}	1.6208**	0.20914**	294.16**	41.00**	262.38*	557.67**
Error	35	2659.4	0.0183	0.00376	7.42	2.14	203.58	2.31

Appendix V. Reduction percentage in agromorphogenic, physiological and nutritional traits under increasing salinity stress

Genotype	**Plant height cm**		**No. of leaves /plant**		**Leaf area (cm^2)**		**Number of branches per plant**		**Days To first flowering**	
	% T2	% T3	% T2	% T3	% T2	% T3	% T2	% T3	% T2	% T3
G1	6.28	9.42	28.47	57.50	16.34	20.52	28.57	47.71	-9.15	5.00
G2	3.23	4.85	18.71	71.33	30.02	29.95	26.90	50.00	-9.57	3.46
G3	1.54	4.63	20.81	37.17	27.04	25.55	34.72	60.83	-6.20	2.27
G4	3.71	5.57	30.76	46.15	5569	67.05	31.59	57.98	-9.76	3.68
G5	1.72	5.18	28.57	30.47	38.43	25.14	23.09	42.26	-12.73	1.80
G6	1.49	2.99	31.73	70.49	39.99	49.85	-12.57	24.95	-15.26	4.86
G7	1.92	3.86	59.04	65.68	17.04	16.64	40.61	50.00	-2.55	2.06
G8	1.82	3.640	68.75	73.75	59.95	60.47	17.36	52.21	-10.17	4.24
G9	3.85	5.79	49.26	65.07	28.59	31.89	22.22	29.67	-29.46	4.10
G10	3.14	6.28	42.42	61.82	6.63	32.16	27.97	36.01	-2.20	0

Appendix V. Cont'd

Genotype	**Days to first fruit setting**		Number of fruit per plant		**Length of fruit (mm)**		**Fruit diameter (mm)**		**Averag e fruit weight (g)**	
	% T2	% T3	% T2	% T3	% T2	% T3	% T2	% T3	% T2	% T3
G1	-9.32	-16	36.17	41.84	12.89	15.67	34.78	43.47	24.20	35.47
G2	-11.73	-17.94	11.26	25.19	12.26	25.00	40.00	52.78	43.38	57.84
G3	-8.69	-14.97	29.76	36.25	34.25	41.45	63.27	72.72	60.00	81.49
G4	-8.81	-11.39	33.76	36.28	23.2	27.2	41.14	45.71	49.14	64.39
G5	-11.45	-20.01	3.20	20.52	25.70	33.40	57.14	68.57	55.76	77.58
G6	-12.90	-18.56	9.12	26.61	24.80	30.38	39.87	46.20	29.72	50
G7	-4.07	-11.32	13.66	19.44	27.29	41.53	50.87	56.06	63.23	75.02
G8	-11.49	20.96	16.20	24.51	20.04	26.26	28.00	40.00	52.45	81.83
G9	-24.44	-21.60	15.75	19.68	16.34	27.50	26.49	40.39	52.27	72.97
G10	-4.26	-12.80	19.43	26.60	10.26	29.99	68.42	76.31	44.28	81.78

Appendix V. Cont'd

Genotype	**Days to first fruit setting**		Number of fruit per plant		**Length of fruit (mm)**		**Fruit diameter (mm)**		**Average fruit weight (g)**	
	% T2	% T3	% T2	% T3	% T2	% T3	% T2	% T3	% T2	% T3
G1	-9.32	-16	36.17	41.84	12.89	15.67	34.78	43.47	24.20	35.47
G2	-11.73	-17.94	11.26	25.19	12.26	25.00	40.00	52.78	43.38	57.84
G3	-8.69	-14.97	29.76	36.25	34.25	41.45	63.27	72.72	60.00	81.49
G4	-8.81	-11.39	33.76	36.28	23.2	27.2	41.14	45.71	49.14	64.39
G5	-11.45	-20.01	3.20	20.52	25.70	33.40	57.14	68.57	55.76	77.58
G6	-12.90	-18.56	9.12	26.61	24.80	30.38	39.87	46.20	29.72	50
G7	-4.07	-11.32	13.66	19.44	27.29	41.53	50.87	56.06	63.23	75.02
G8	-11.49	20.96	16.20	24.51	20.04	26.26	28.00	40.00	52.45	81.83
G9	-24.44	-21.60	15.75	19.68	16.34	27.50	26.49	40.39	52.27	72.97
G10	-4.26	-12.80	19.43	26.60	10.26	29.99	68.42	76.31	44.28	81.78

Appendix V. Cont'd

Genotype	**Yield per plant (gm/plant**		**Root length (cm)**		**Chlorophyll content (%)**		**Relative water content**	
	% T2	% T3	% T2	% T3	% T2	% T3	% T2	% T3
G1	-2.43	30.00	20.90	19.19	48.60	58.03	-5.29	-11.31
G2	-12.76	10.10	24.15	47.19	14.04	15.57	36.70	-7.43
G3	37.5	63.75	80.02	92.01	12.32	36.52	16.70	21.78
G4	22.03	22.88	27.91	43.16	51.13	57.53	16.10	25.53
G5	1.18	24.54	27.00	50.21	58.02	58.68	5.80	42.96
G6	14.86	33.73	12.43	55.20	15.42	41.49	20.93	36.27
G7	10.39	37.16	30.91	46.24	42.72	57.20	20.23	69.21
G8	28.33	40.00	35.85	42.75	16.05	31.40	21.52	-21.30
G9	-32.3	8.06	30.10	44.22	50.89	63.11	39.55	61.63
G10	31.06	-8.08	72.64	81.38	35.35	51.11	33.25	19.83