INFLUENCE OF NEB AND FERTILIZER ON GROWTH, YIELD AND SEED QUALITY OF BRINJAL

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CERTIFICATE

*This is to certify that the thesis entitled, **"INFLUENCE OF NEB AND FERTILIZER ON GROWTH, YIELD AND SEED QUALITY OF BRINJAL"** submitted to the Institute of Seed Technology, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE** in **SEED TECHNOLOGY** embodies the result of a piece of bona fide research work carried out by **AVIJIT CHOWDHURY**, Registration No. **11-04375** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

Dated:

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Dedicated to

"My beloved parents
and
all humankind"

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INFLUENCE OF NEB AND FERTILIZER ON GROWTH, YIELD AND SEED QUALITY OF BRINJAL

ABSTRACT

The study was conducted in the research field of Sher-e-Bangla Agricultural University (SAU), Dhaka-1207, during February, 2016 to May, 2016 to evaluate the influence of NEB and fertilizer on growth, yield and seed quality of brinjal. ACI variety (Happy) and BARI brinjal 7 (Singnath) were used as planting material under present study. The experiment consisted of eight different doses of NEB in combinations with inorganic fertilizers namely, T_1= 50% recommended urea+750 ml NEB ha^{-1}, T_2= 50% recommended urea+1000 ml NEB ha^{-1}, T_3= 50% recommended urea+1250 ml NEB ha^{-1}, T_4= 50% recommended urea+1500 ml NEB ha^{-1}, T_5= 50% recommended urea and 25% reduction of P, K, S+1000 ml NEB ha^{-1}, T_6= 50% recommended urea and 25% reduction of P, K, S+ 1250 ml NEB ha^{-1}, T_7=50% recommended urea and 25% reduction of P, K, S+1500 ml NEB ha^{-1} and T_8= 100% recommended fertilizer. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Significant effect of variety was observed on plant height, number of leaves plant^{-1}, number of branches plant^{-1}, days to first flowering, number of fruits plant^{-1}, fruit length, fruit breadth, weight of total fruits, yield, 1000-seeds weight, germination percentage, seed vigor index, shoot length and root length. Different doses of NEB and inorganic fertilizers exerted significant effect on plant height, number of leaves plant^{-1}, number of branches plant^{-1}, stem diameter, days to first flowering, number of fruits plant^{-1}, fruit length, fruit breadth, weight of total fruits, yield, 1000-seeds weight, germination percentage, seed vigor index, shoot length, root length, shoot dry weight, root dry weight. Interaction effect between variety and different doses of NEB and chemical fertilizers exerted significant effect on growth, yield attributes, yield and seed quality *viz.*, plant height, number of leaves plant^{-1}, number of branches plant^{-1}, stem diameter, days to first flowering, number of fruits plant^{-1}, fruit length, fruit breadth, weight of total fruits, yield, 1000-seeds weight, germination percentage, seed vigor index, shoot length, root length, root dry weight. The highest values in fruit weight (100.72 g), yield (34.76 t ha^{-1}), germination percentage (85.33 %), seed vigor index (1546.66) were obtained with ACI variety using 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}. While the lowest values in the respective parameters (64.22 g, 14.36 t ha^{-1}, 65.67 %, 970.00) respectively were observed in Singnath variety with 50% recommended urea+750 ml NEB ha^{-1}. It was revealed that the application of NEB as Natural Root Exudates (NRE) had the capacity to improve the performances of brinjal. Considering the yield attributes and yield of brinjal and brinjal seed, the application of 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB per hectare with ACI variety (Happy) exhibited significantly the best one.

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LIST OF ACRONYMS AND ABBREVIATIONS

AEZ	Agro-Ecological Zone
Agric.	Agriculture
Agril.	Agricultural
Agron.	Agronomy
Appl.	Applied
Biol.	Biology
Chem.	Chemistry
cm	Centi-meter
CV	Coefficient of variance
DAT	Days After Transplanting
Ecol.	Ecology
Environ.	Environmental
et al.	et alii, And Others
Exptl.	Experimental
g	Gram
i.e.	*id est* (L), that is
j.	Journal
kg	Kilogram
LSD	Least Significant Difference
M.S.	Master of Science
m^2	Meter squares
mg	Miligram
NEB	Nitrogen Efficiency Bio-availability
NRE	Natural Root Exudates
Nutr.	Nutrition
Physiol.	Physiological
Res.	Research
RCBD	Randomized Complete Block Design
SAU	Sher-e-Bangla Agricultural university
Sci.	Science
Soc.	Society
T ha^{-1}	Ton per hectare
Viz.	*videlict* (L.), Namly
%	Percentage
@	At the rate of

Chapter I
INTRODUCTION

Brinjal (*Solanum melongena* L.) is one of the major vegetable crops under Solanaceae family. It is also known as Aubergine or Guinea squash or garden egg elsewhere. It is one of the most common, popular and principle vegetable crops due to its diversified uses. It is cultivated as commercial vegetable throughout the tropical and sub-tropical regions of the world. Brinjal is the second most important vegetable crop next to potato in Bangladesh in respect of acreage and production (BBS, 2016). Brinjal is a native crop of Indian sub-continent. A wide genetic diversity is found here due to the availability of different land races and their Wild relatives.

The brinjal or eggplant is a crop of uncertain origin. The cultivated brinjal is undoubtedly of Indian origin and has been in cultivation for a long time (Thompson and Kelly, 1957). The domesticated types of brinjal were spread eastward from India to China by fifth Century B. C. So, the center of origin is the India sub-continent with a secondary center of origin in China and South-east Asia. According to (Purewal, 1957), it is still found growing wild in India. Different forms, colours, sizes and shapes of brinjal are found throughout the South-east Asia suggesting that this area is an important centre of diversity and possibly of origin. Now, the brinjal is of great importance in the warm areas of Far East, being grown more extensively in India, Bangladesh, Pakistan, China and Philippines. It is also grown in Nepal, Japan, France, Italy, USA, the Mediterranean and Balkan area (Bose and Som, 1986).

Brinjal is grown commonly in almost all parts of our country and liked by the people both poor and rich. It is a main vegetable to the poor people and is available more or less throughout the year. Contrary to the common belief, it is quite high in nutritive value and can be compared with tomato (Choudhury, 1976). Brinjal is nutritious vegetable and has got multifarious use as a dish item (Bose and Som, 1986 and Rashid, 1993). It has higher calorie, iron, phosphorus and riboflavin contents than tomato (Shaha, 1989). Brinjal is high in water content and potassium.100 gram brinjal contains calcium 525 mg, potassium 618mg, carbohydrates 17.8 g, protein 8 g, fat 27.5 Cholesterol 16mg, Dietary Fiber 4.9g, Iron 6mg, Vitamin A 6.4 mg, Sodium 62 mg, Sugars 1l.4 g (Islam, 2005). It has been a staple vegetable in our diet since ancient times. It is quite high in nutritive value. It has potentiality as raw material in pickle making and in dehydration industries (Singh *et al.,* 1963). Fried brinjal has some medicinal value to cure liver problem (Chauhan, 1981). Brinjal is a familiar vegetable crop for its easier cooking quality, better taste and lower market price. It is largely cultivated in almost all districts of Bangladesh. It can be grown at homestead area and kitchen garden because of its popularity especially for urban people. About 8 million farm families are involved in brinjal cultivation (Islam, 2005). This gives small, marginal and landless farmers a continuous source of income, provides employment facilities for the rural people. In Bangladesh, brinjal crops cover 57,745 hectares with a production of 3,39,795 metric tons (BBS, 2012). Brinjal constitutes about 25.4% of the total vegetable area of the country. The main growing districts are: Bogra, Chittagong, Comilla, Dhaka, Dinajpur, Faridpur, Jamalpur, Jessore, Khagrachari, Khulna, Mymensingh, Rangamati, Rangpur,Rajshahi, Sylhet, and Tangail (BBS, 2012). Many insect, pest and disease attack brinjal plants and fruits. Yield expression of a genotype is mainly governed by environment and other management factors. The varieties of eggplant exhibit a great range of fruit shape and appearance from oval (egg shaped) to long club shaped. Colour of fruit also varied among the varieties such as white, yellow and green with different degrees of purple pigmentation to black. Tropical Chinese and Indian types have been established for commercially important varieties. The fruit production of brinjal per unit area is very less in Bangladesh as compared to western countries.

However, roots secrete an enormous range of compounds into the surrounding soil. This area, called the rhizosphere, can be divided into three zones: endorhizosphere (root tissue, including the endodermis and cortical layers), rhizoplane (the root surface with the epidermis and mucilage) and ectorhizosphere (the soil nearby the root) (Lynch, 1987). The first observation that microbes are more abundant in the rhizosphere than in distant soil was made by Hiltner (1904). In recent years, the field of rhizosphere biology has explored the relative importance of root exudates in mediating interactions with neighbouring plants and microbes (Bais *et al.,* 2004, 2006; Weir, *et al.,* 2004; Bais *et al.,* 2008). Root exudation is part of the rhizode position process, which is a major source of soil organic carbon released by plant roots (Hutsch *et al*., 2000; Nguyen, 2003).The quantity and quality of root exudates are determined by plant species, the age of an individual plant and external factors like biotic and abiotic stressors. Root exudation clearly represents a significant carbon cost to the plant (Marschner, 1995), with young seedlings typically exuding about 30–40% of their fixed carbon as root exudates (Whipps, 1990). Root exudates contain released ions (i.e. H+), inorganic acids, oxygen and water, but mainly consist of carbon-based compounds (Uren, 2001; Bais *et al.,* 2006).

Despite the technical difficulties inherent in the study of plant roots, significant advances in root research have been made using molecular and genetic tools. In addition, the knowledge gained by studying the root system of the model plant *Arabidopsis thaliana* (L.) Heynh has been indispensable in advancing our understanding of the impact of agricultural practices on root development and the impact of roots (and their exudates) on the soil environment (Bucher, 2002). Molecular tools, such as cloning of root-specific genes, differential and subtractive hybridization techniques (Conkling *et al.*, 1990; Rodriguez and Chader, 1992), differential display (Liang and Pardee, 1992), root-specific cDNA libraries (Bucher *et al.*, 1997) and analyzing root cell-specific gene expression using a combination of molecular tools (Birnbaum *et al.*, 2003), have resulted in the rapid compilation of new information on root development, physiology and biochemistry. In addition, the development of „composite plants" (transgenic „hairy root" systems with nontransgenic shoot systems) by employing *Agrobacterium rhizogenes*-mediated transformation methods has enabled studies of root-specific biochemistry, endosymbiosis, production of secondary metabolites and root-specific interactions (Boisson-Dernier *et al.,* 2001; Choi *et al.,* 2004; Lee *et al.,* 2004; Limpens *et al.,* 2004).

Nitrogen Efficiency Bio-availability is an organic product with mineral or other components. NEB is a natural origin product, in liquid and dry forms, that are non-toxic and non-hazardous. NEB influences microbial populations which makes nutrients more available. It influences mycorrhizae which collect, store and deliver nutrients directly to the plants. Plant root exudates constitute up to 30 to 40% of the plants photosynthetic productivity (Samtsevich, 1965).

NEB product contain a small amount of nutrients but NEB is an additive that allows more of the nutrients supplied by fertilizer to be used which results in superior yields. It increases yields at an economic cost which results in greater profits. Root exudates are known to enhance growth rates of bacteria (Hartwig *et al.*, 1994). Plant roots release as much as 20% of their assimilates as root exudates in the form of organic acid, amino compounds, sugars and phosphate esters (Uren, 2001; Whipps, 1990). Unseen part of the plant secretes chemical compounds which acts as communication signal between the adjacent plant and microbial community present in the rhizosphere of the root. The main functions of the „hidden" part of the plant, its root system, have traditionally been thought to be anchorage and uptake of nutrients and water.

Root exudates correspond to an important source of nutrients for microorganisms in the rhizosphere and seem to participate in early colonization inducing chemotactic responses of rhizospheric bacteria (Bacilio *et al.*, 2004). Rhizosphere is defined as a zone of most intense bacterial activity around the roots of plant (Badri and Vivanco, 2009). Root exudate is one of the ways for plant communication to the neighboring plant and adjoining of microorganisms present in the rhizosphere of the root. The chemicals ingredients of the root exudates are specific to a particular plant species and also depend on the nearby biotic and abiotic environment. The chemical ingredient exuded by plant roots include amino acids, sugars, organic acids, vitamins, nucleotides, various other secondary metabolites and many other high molecular weight substances as primarily mucilage and some unidentified substances. Root exudate helps the plant to form partnerships with beneficial microbes and mycorrhiza.

Plant encourages this partnership by secreting root exudates, which finally stimulate microbes and mycorrhiza. Root exudates mediate various positive and negative interactions like plant-plant and plant-microbe interactions. But research works on NEB with brinjal are very scarce in Bangladesh. Therefore, the study was aimed a field experiment with the following objectives:

i. To study the role of NEB on yield and seed quality of Brinjal
ii. To select the optimum rate of NEB along with other fertilizers for maximizing yield and seed quality of brinjal.

Chapter II

REVIEW OF LITERATURE

The benefits of using organic manures in crop production had long been known. Now-a-days, many experimental evidences are available regarding the usefulness of using organic matter in the soil. The information on the effect of organic manures on the growth and yield of brinjal seems to be inadequate. There is a relationship between nitrogen application and organic manures. However, some of the available literatures related to the present experiment have been reviewed in this chapter.

Among the factors that affect crop production, fertilizer is one of the most crucial factors, which ultimately increase the total yield of any crop. Now a day, fertilizer holds the key to the success of the crop production system of Bangladesh. Nitrogenous fertilizer is one of the most used fertilizers, which has an important physiological activity on plant body. Formation of chlorophyllous tissue is one of the most important functions of nitrogen, which help in photosynthesis of plant. Thus application of more nitrogenous fertilizer caused more vegetative growth and development of plant.

Naqqash *et al*. (2016) carried out an observation to overcome high fertilizer demand (especially nitrogen) using five bacteria, i.e., *Azospirillum* sp. TN10, *Agrobacterium* sp. TN14, *Pseudomonas* sp. TN36, *Enterobacter* sp. TN38 and *Rhizobium* sp. TN42 which were isolated from the potato rhizosphere on nitrogen-free malate medium and identified based on their 16S *rRNA* gene sequences and also reported that Rhizosphere engineering with beneficial plant growth promoting bacteria offers great promise for sustainable crop yield such as potato. Potato is an important food commodity that needs large inputs of nitrogen and phosphorus fertilizers. Inoculation with these bacteria under axenic conditions resulted in differential growth responses of potato. *Azospirillum* sp. TN10 incited the highest increase in potato fresh and dry weight over control plants, along with increased N contents of shoot and roots. All strains were able to colonize and maintain their population densities in the potato rhizosphere for up to 60 days, with *Azospirillum* sp. and *Rhizobium* sp. showing the highest survival. Plant root colonization potential was analyzed by transmission electron microscopy of root sections inoculated with *Azospirillum* sp. TN10. *Azospirillum* sp. TN10 has the greatest potential to increase the growth and nitrogen uptake of potato. Hence, it is suggested as a good candidate for the production of potato biofertilizer for integrated nutrient management as organic root exudates.

Shehata *et al*. (2016) pointed out that Bio-stimulant as natural root exudates may enhance the yield and improve crop quality and their study aimed to evaluate the use of two bio-stimulants for reducing the nitrate content and improving the commercial quality of head lettuce. This study was arranged in a split plot experiment in three replications. The treatments included two nitrogen sources (ammonium nitrate and ammonium sulfate) as main plot and two bio-stimulants, FZB 24 and Actiwave as sub-plot. The criteria measured were fresh and dry weights of leaves, number of leaves, yield and the contents of nitrogen, nitrate total sugars as well as chlorophyll and carotenoid contents. Results obtained showed that regardless of the nitrogen source, the FZB 24 and Actiwave at both rates significantly increased the leaf number, fresh and dry weights of leaves and the total yield. The highest contents of chlorophyll, total sugars, carotenoids and lower nitrate contents were found in lettuce leaves treated with FZB 24 and Actiwave at the increased rates. The nitrogen source application did not affect the fresh and dry weight of leaves, the yield, the total sugars and chlorophyll contents. Whereas, ammonium sulfate as a nitrogen source significantly increased the leaf number and decreased the nitrate content. Biostimulants exerted a positive role with regard to yield and quality of head lettuce.

Szoboszlay *et al*. (2016) conducted an experiment to investigate how root exudate flavonoids influence the soil bacterial community structure and to identify members of the community that change their relative abundance in response to flavonoid exudation. Using a model system that approximates flavonoid exudation of Medicago sativa roots, we treated a soil with 7, 40-dihydroxyflavone and naringenin in two separate experiments using three different rates: medium (equivalent to the exudation rate of 7, 40-dihydroxyflavone from M. sativa seedlings), high (10× the medium rate), and low (0.1× the medium rate). Controls received no flavonoid. Soil samples were subjected to ATP assays and 16S rRNA gene amplicon sequencing. The flavonoid treatments caused no significant change in the soil ATP content. With the high 7, 40-dihydroxyflavone treatment rate, operational taxonomic units (OTUs) classified as Acidobacteria sub-division 4 increased in relative abundance compared with the control samples. The OTUs classified as Gaiellales, Nocardioidaceae, and Thermomonosporaceae were more prevalent in the control. The naringenin treatments did not cause significant changes in the soil bacterial community structure. Their results suggested that the root exudate flavonoid 7, 40-dihydroxyflavone can interact with a diverse range of soil bacteria and may have other functions in the rhizosphere in addition to nod gene induction in legume-rhizobia symbiosis.

Balendres *et al*. (2016) reported that, root exudation has importance in soil chemical ecology influencing rhizosphere microbiota. Prior studies reported root exudates from host and nonhost plants stimulated resting spore germination of *Spongospora subterranea,* the powdery scab pathogen of potato, but the identities of stimulatory compounds were unknown. This study showed that potato root exudates stimulated *S. subterranea* resting spore germination, releasing more zoospores at an earlier time than the control. They detected 24 low molecular weight organic compounds within potato root exudates and identified specific amino acids, sugars, organic acids, and other compounds that were stimulatory to *S. subterranea* resting spore germination. Given that several stimulatory compounds are commonly found in exudates of diverse plant species, they supported observations of non-host specific stimulation.

Wierzbowska *et al*. (2015) reported that Growth regulators stimulate life processes in plants, improving their stress resistance and health, which translates into higher and better quality yield. Growth regulators can improve biochemical parameters of tubers and enhance the potato‟s resistance to adverse environmental conditions or pathogens. The purpose of this research was to examine the effect of biostimulators on yield and selected chemical properties of potato tubers. Four table potato cultivars were grown in a feld experiment: very early Volumia and medium early Irga, Satina and Sylvana. Starting from stage 39 on the BBCH scale (crop cover complete), potato plants were treated thrice, in 10- to 14-day intervals, with the growth regulators Asahi SL, Bio-Algeen S90 and Kelpak. The reference treatment was composed of potatoes untreated with the bioregulators. The growth regulators, especially Bio-Algeen S90 (6.3-16.3%) and Kelpak SL (14.2-24.7%) raised the tuber yield, but the effect was statistically verifiable only in the second year, with less precipitation and lower temperature of the vegetation period. The quality of potato tubers was more strongly dependent on the cultivar-specifc traits than on the applied biostimulators. In the second year, too, potato tubers contained on average 34% more N-total than in the frst year. During storage, the content of N-total in tubers increased by 35-50%. After a five-month storage period, potato tubers contained more NO3- abut less N-NH4+.

Huang *et al*. (2014) studied the interactions between plants and their microbial communities in the rhizosphere are important for developing sustainable management practices and agricultural products such as biofertilizers and biopesticides also act as natural root exudates. Plant roots release a broad variety of chemical compounds to attract and select microorganisms in the rhizosphere. In turn, this plant associated microorganisms, via different mechanisms, influence plant health and growth. In this review, we summarize recent progress made in unraveling the interactions between plants and rhizosphere microbes through plant root exudates, focusing on how root exudate compounds mediate rhizospheric interactions both at the plant–microbe and plant–microbiome levels. We also discuss the potential of root exudates for harnessing rhizospheric interactions with microbes that could lead to sustainable agricultural practices.

Doornbos *et al*. (2012) conducted a study to assess better implications of shifts in the rhizosphere microflora and reviewed the effects of root exudates on soil microbial communities. They reported that current knowledge on inducible defense signaling in plants is discussed in the context of recognition and systemic responses to pathogenic and beneficial microorganisms resulting more nutrients will be available to the plant. Plants affect their rhizosphere microbial communities that can contain beneficial, neutral and pathogenic elements. Interactions between the different elements of these communities have been studied in relation to biological control of plant pathogens. Such applications may however affect microbial communities associated with plant roots and interfere with the functioning of the root microbiota. Here, they reviewed the possible impact of plant defense signaling on bacterial communities in the rhizosphere resulted from action of microflora acted as natural root exudates.

Roumeliotis *et al*. (2012) carried out an experiment on various transcriptional networks and plant hormones have been implicated in controlling different aspects of potato tuber formation as natural root activity enhancers. Due to its broad impact on many plant developmental processes, a role for auxin in tuber initiation has been suggested but never fully resolved. Here, auxin concentrations were measured throughout the plant prior to and during the process of tuber formation. Auxin levels increase dramatically in the stolon prior to tuberization and remain relatively high during subsequent tuber growth, suggesting a promoting role for auxin in tuber formation. Furthermore, *in vitro* tuberization experiments showed higher levels of tuber formation from axillary buds of explants where the auxin source (stolon tip) had been removed. This phenotype could be rescued by application of auxin on the ablated stolon tips. In addition, a synthetic strigolactone analogue applied on the basal part of the stolon resulted in fewer tubers. The experiments indicate that a system for the production and directional transport of auxin exists in stolons and acts synergistically with strigolactones to control the outgrowth of the axillary stolon buds, similar to the control of above-ground shoot branching.

Badri and Vivanco (2009) reported that Root-secreted chemicals mediate multi-partite interactions in the rhizosphere, where plant roots continually respond to and alter their immediate environment. Increasing evidence suggested that root exudates initiate and modulate dialogue between roots and soil microbes. For example, root exudates serve as signals that initiate symbiosis with rhizobia and mycorrhizal fungi. In addition, root exudates maintain and support a highly specific diversity of microbes in the rhizosphere of a given particular plant species, thus suggesting a close evolutionary link. In this review, we focus mainly on compiling the information available on the regulation and mechanisms of root exudation processes, and provide some ideas related to the evolutionary role of root exudates in shaping soil microbial communities.

Khattak *et al.* (2001) studied the effect of different levels of nitrogen on the growth and yield of different cultivars of eggplant under the agro-climatic conditions of Peshawar. Effect of different nitrogen levels (0, 50, 75, 100, 125, 150 kg ha^{-1}) on aubergines (*Solarium melongena*) cultivars Black Bahar, Long Purple, Neelam Long and Special Black were studied at Agriculture Research Institute Tamab, Peshawar, Pakistan, in 2000. Different levels of nitrogen significantly increased number of branches, leaves and fruits/plant, stem thickness, plant height and yield at 125 kg nitrogen/ha, while minimum values for these parameters were observed in different treatments. Maximum number of branches (7.84), leaves (285.380) and fruits/plant (13.67), stem thickness (1.19 cm) and yield (17674.91 kg ha^{-1}) were noted for the plants receiving 125 kg nitrogen/ha, while minimum number of branches (6.37), leaves (280.77) and fruits $plant^{-1}$ (11.08) were obtained in control treatment and minimum stem thickness (1.01 cm) and yield (14062.41 kg ha^{-1}) were found when 50 kg nitrogen ha^{-1} was applied.

Naidu *et al.* (1997) mentioned that the effects NPK fertilizers in combination with organic manures (farmyard manure, poultry manure and vermicompost) and biofertilizers (phosphate solubilizing bacteria and Azospirillum) on the growth and yield of aubergine cv. JB-64 were investigated during the rabi seasons of 1996/97, 1997/98 and 1998/99 in Jabalpur, Madhya Pradesh, India. Data were recorded for plant height, number of leaves per plant, number of branches per plant, fruit length, fruit girth, number of fruits per plant and fruit yield. NPK at 100:60:50 kg ha^{-1} + farmyard manure at 25 t/ha recorded the highest values for most parameters studied. NPK at 75:35:0 kg/ha + farmyard manure at 25 t/ha recorded the highest fruit girth and earliest 50% flowering. The highest mean fruit yield (161.62 q ha^{-1}) and net return (Rs. 24 140.50) were obtained with the former, while the highest benefit: cost ratio (2.212) was obtained with the latter treatment. The differences in yield and profitability between these treatments were not significant.

Sharma (1995) reported that in tomato (cv. Pusa Ruby) the plant height, fruit number, seed yield $plant^{-1}$ and seed yield/ha were increased with increasing rates of N. The highest yield of seeds was observed due to 120 kg N ha^{-1}.

Subramanian *et al.* (1993) stated that plant height and quality were increased with increasing rate of N application. They obtained the highest yield with 150 kg N/ha. The levels used were 0, 5, 100 and 150 kg ha^{-1}.

Singh and Maurya (1992) reported that same trend of increasing rate of N application on brinjal plant. They obtained the best yield from 120 kg N ha^{-1}. The levels of nitrogen were 0, 60, and 120 kg N ha^{-1}.

Nasreen and Islam (1990) also investigated the fertilizer effect on tomato yield and found that the yield response was linear with the levels of nitrogen and nitrogen application had certain optimum range beyond which the yield of tomato would not increase.

Rawsthorne and Brodie (1986) observed the response of *Globodera rostochiensis* in potato root diffusate (PRD) collected by soaking individual potato, Solanum tuberosum, root systems in water for 2 hours was used to assess the relationship between root growth and PRD production. Resistant potato cultivars Hudson and Rosa were used as test plants. Maximum hatch occurred in PRD collected 3 weeks after plant emergence (APE) in the greenhouse, and declined after this time. Hatch was positively correlated with increased root weight only during the first 3 weeks AE. Hudson PRD was consistently more active than Rosa PRD in stimulating hatch, except when adjusted for root weight. Although the results indicated that cells at the root tip produced a more active PRD than cells located elsewhere, PRD appeared to be produced along the entire root. Differences in time length of the vegetative growth phase, extent of root growth, and volume of roots, rather than the production of a more active PRD percent in soil.

By reviewing the different sources of information regarding the present experiment it was found and taken that, the application of root exudates has the potentiality to response against different traits of brinjal and other crops. So, different doses of NEB in combination with different levels of chemical fertilizers were taken for the present study to observe the response on vegetative growth, yield and quality attributes of brinjal.

CHAPTER III
METERAIALS AND METHODS

A brief description about experimental, site, climatic condition, planting materials, treatments, experimental design and layout, crop growing procedure, intercultural operations, data collection and statistical analysis were described in this chapter. The details of experimental materials and methods are described below:

3.1 Experimental period and site

The study was conducted in the research field of Sher-e-Bangla Agricultural University (SAU), Dhaka-1207, during February, 2016 to May, 2016. The experimental area belonged to 23°7'N latitude and 93°E' longitude at an altitude of 8.6 meter above the sea level (Anon, 2004) under agro-ecological zone of “Madhupur Tract”, AEZ-28. The experimental site is shown in the map of AEZ of Bangladesh in (Appendix I).

3.2 Climate and soil

The experimental site provably most characterized by winter during the months from February, 2016 to May, 2016 with a significant monsoon climatic with sub-tropical cropping zone. Top soil was characterized by silty clay in texture, olive- gray whitish with common fine to medium distinct dark whitish brown mottles was seen on the top soil. The soil was also characterized by pH-5.60 and organic carbon-0.451%. The experimental area flat and medium high topography with was available with an easy irrigation and drainage system. The weather data during the study period at the experimental site including maximum and minimum temperature, total rainfall and relative humidity were shown in (Appendix II and III).

3.3 Planting material

In this research work, the seeds of two brinjal varieties were used as planting materials. The brinjal varieties used in the experiments were ACI variety (Happy) and BARI brinjal 7 (Singnath). All varieties are semi-indeterminate type and the seeds were collected from the Horticulture Research Centre, Bangladesh Agricultural Research Institute (BARI) at Joydebpur and ACI seed company.

3.4 Treatments

The present experiment comprised of seven different treatment of NEB in combination with urea and PKS fertilizers as follows:

T_1= 50% recommended urea + 750 ml NEB ha^{-1}

T_2= 50% recommended urea + 1000 ml NEB ha^{-1}

T_3= 50% recommended urea + 1250 ml NEB ha^{-1}

T_4= 50% recommended urea + 1500 ml NEB ha^{-1}

T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}

T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}

T_7= 50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}

T_8= 100% recommended fertilizer

3.5 Experimental design and layout

The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The total numbers of unit plots were 48. The size of unit plot was 2.5 m × 3.0 m. The spacing 75 cm × 60 cm was used under present study. A layout of present experiment shown in (Appendix IV).

3.6 Collection and sowing of brinjal seeds

The seeds of one brinjal varieties developed by Bangladesh Agricultural Research Institute (BARI) were collected from the BARI, Joydebpur, Gazipur and another variety was collected from ACI Company. Before sowing, seeds were pre-soaked for 24 hours to ensure germination. The seeds of all brinjal varieties were sown separately in the seed bed on mid-February, 2016.

3.7 Land preparation

The land of the experimental site was first opened in the first week of February with power tiller and to obtain the desirable tilth the land was ploughed and cross-ploughed four times followed by laddering. Weeds and stubbles were removed from the corners of field using spade. The land was finally prepared on 12 February 2016. In order to avoid water logging due to rainfall during the study period, drainage channels were made around the land. The soil was treated with Furadan 5G @ 20 kg ha^{-1} when the plot was finally ploughed to protect the young plant from the attack of cut worm.

3.8 Fertilizers application

The crop was fertilized as per treatments and recommended dose of fertilizers at the rate of 160-44-132-15-2-5 kg ha^{-1} of N-P-K-S-B-Zn, respectively, as Urea, TSP, MoP, gypsum, boric acid and zinc sulphate were applied in the field during final land preparation (Mondal *et al.*, 2013). Recommended rate of N was 160 kg ha^{-1}, the required amount of urea was applied as per treatments. Normally urea was applied in three equal split installments with different levels of NEB at 30 DAT, 45 DAT and 60 DAT. MoP was also added with two split doses.

3.9 Seedling transplanting

One and half month old seedlings of different brinjal varieties were transplanted in the well prepared pits of unit plots assigned for each variety according to the design and layout of the experiment.

The necessary intercultural operations including irrigation, weeding, top dressing of nitrogen fertilizer, tagging, etc were done in proper time. The seedling trays were watered before uprooting the seedling from the tray so as to minimize root damage. Healthy and uniform sized seedling of 30 days old were taken separately from the tray and transplanted in the experimental plots in the afternoon, maintaining a spacing of 75 cm between the rows and 60 cm between the plants. The seedlings were watered after transplanting and continued for several days for their establishment in the field.

3.10 Intercultural operations

After transplanting the seedlings, different intercultural operations were accomplished for better growth and development of the plants.

3.10.1 Gap filling

When the seedlings were established, the soil around the base of each seedling was pulverized. Very few seedlings were damaged after transplanting and the damaged seedlings were replaced by new healthy seedlings from the same stock. Those seedlings were transplanted with a high mass of soil with roots to minimize transplanting shock.

3.10.2 Weeding

The plants were kept under careful observation. Weeding was done as and when necessary to keep the plots clean. Weeding was done at every 15 days interval from planting to peak flowering stage. Spading was done from time to time specially to break the soil crusts and keep the land weed free after each irrigation.

3.10.3 Irrigation

Irrigations were given as and when necessary by observing the soil moisture condition. Irrigation was given throughout the growing period. The first irrigation was given 40 days after planting followed by another irrigation 20 days after the first irrigation. Each fertilizing was followed by irrigation.

3.10.4 Earthing up

Earthing up was done as and when required by taking the soil from the space between the rows.

3.11 Plant Protection

3.11.1 Insect Pest

As preventive measure against the insect pests like cutworms, shoot and fruit borer, leafhopper etc. Admire 200 SL @ 1 ml l^{-1}, Ripcord @ 1 ml l^{-1}, Volium Flexi @ 1 ml l^{-1} were applied to reduce the attack in the field. Many cleaning practices were also done to reduce the insect attack. Ripcord was also given to control the insect pest.

3.11.2 Diseases

Precautionary measures against various diseases of brinjal were taken. Neem powder mixed with water and ash spraying was done to control the diseases of brinjal. In case of fungal infection Bavistin was applied.

3.13 Recording of data

Different types of data were collected on the basis of the aims of the present study. Most of the parameters were taken after harvesting of brinjal by using electronic balance and rest of the parameters were taken by using plastic scale, slide calipers and measuring tape and means were calculated by using a digital calculator.

3.13.1 Yield attributes and yield

Plant height

Number of total branches per 5 plants per plot was recorded for each of two brinjal varieties at 50 DAT, 70 DAT and 90 DAT intervals and the average plant height was calculated.

Number of leaves plant^{-1}

Number of total leaves per 5 plants per plant was recorded for each of 2 brinjal varieties at 50 DAT, 70 DAT and 90 DAT intervals and the average number of total leaves per plant was calculated.

Number of branches plant^{-1}

Number of total branches per 5 plants per plot was recorded for each of 2 brinjal varieties at 50 DAT, 70 DAT and 90 DAT intervals and the average number of total leaves per plant was calculated.

Stem diameter

Stem diameter per 5 tagged plants per plot was recorded for each of 2 brinjal varieties at 50 DAT, 70 DAT and 90 DAT intervals and the average girth of total fruits per plant was calculated.

Days to first flowering

Days to first flowering of 5 plants per plot was recorded for each of 2 brinjal varieties at 7 days interval and the average number of total fruits per plant was calculated.

Number of fruits per plant

The total number of fruits per 5 plants per plot was recorded for each of 2 brinjal varieties at 7 days interval in four times and the average number of fruits per plant was calculated.

Fruit length

Length of fruits per 5 plants per plot was recorded for each of 2 brinjal varieties the average length of total fruits per plant was calculated.

Fruit breadth

Breadth of plant per 5 plants per plot was recorded for each of 2 brinjal varieties and the average breadth of total fruits per plant was calculated.

Fruit length breadth ratio

Length breadth ratio of 5 plants per plot was recorded for each of 2 brinjal varieties and the average length breadth ratio of plant was calculated.

Average fruit weight (g)

Weight of total fruits per 5 plants per plot was recorded for each of 2 brinjal varieties and the average fruit weight of plant was calculated.

Yield t ha^{-1}

Yield of fruits per 5 tagged plants per plot was recorded for each of 2 brinjal varieties and the average weight of total fruits per plant was calculated.

3.13.2 Seed characteristics

1000-seeds weight

5 brinjal was recorded for each of 2 brinjal varieties and the average 1000-seeds weight per seedling was calculated.

Germination percentage

100 seeds were recorded for each of 2 brinjal varieties and the germination percentage per seedling was calculated.

Seed Vigor Index (SVI)

This is calculated by determining the germination percentage and seedling length of the same seed lot. Fifty seeds each in four replications arc germinated in towel papers as prescribed for the crop species in germination test. While evaluating the number of normal seedlings at the time of final count the seedling length of 5 randomly selected seedlings are also measured. Seed vigor index is calculated by multiplying germination (%) and seedling length (cm).The seed lot showing the higher seed vigor index is considered to be more vigorous (Abdul-Baki and Anderson, 1973).

Shoot length

Shoot length 5 brinjal seedlings were recorded for each of 2 brinjal varieties and the average shoot length per seedling was calculated.

Root length

Root length 5 brinjal seedlings were recorded for each of 2 brinjal varieties and the average root length per seedling was calculated.

Shoot root length ratio

Shoot root length 5 brinjal seedlings were recorded for each of 2 brinjal varieties and the average shoot root length ratio per seedling was calculated.

Shoot dry weight

Shoot dry weight 5 brinjal seedlings were recorded for each of 2 brinjal varieties and the average Shoot dry weight per seedling was calculated.

Root dry weight

Root dry weight 5 brinjal seedlings were recorded for each of 2 brinjal varieties and the average root dry weight per seedling were calculated.

Shoot root dry weight ratio

Shoot root dry weight 5 brinjal seedlings were recorded for each of 2 brinjal varieties and the average shoot root dry weight per seedling was calculated.

3.14 Statistical Analysis

The data on various parameters under study were statistically analyzed using MSTAT package program. The mean for all the treatments was calculated and analyses of variances for all the characters were performed by F-variance test. The significance of differences between pairs of treatment means was evaluated by the adjusted by using LSD (Least Significant Difference) at 5% and 1% level of probability.

CHAPTER IV

RESULT AND DISCUSSION

The experiment was conducted to investigate the performance of natural root exudates (nitrogen efficiency bio-availability) on growth, yield and quality of brinjal. The data have been presented in Table 1 to 23 and Figures 1 to 19 and a summary of the analysis of variance in respect of all the parameters have been shown in Appendix I to V. The results of each parameter have been presented and discussed under the following headings.

4.1 Yield and yield contributing characters

4.1.1 Plant height (cm)

Variety showed statistically significant variation in respect of plant height (Appendix V). However between the variety, V_1 (ACI variety) showed the highest plant height (49.26, 73.07 and 80.30 cm at 50, 70 and 90 DAT, respectively) (Figure 1). The lowest plant height (40.16, 59.58 and 65.47 cm at 50, 70 and 90 DAT, respectively) was observed in the V_2 (Singnath) variety.

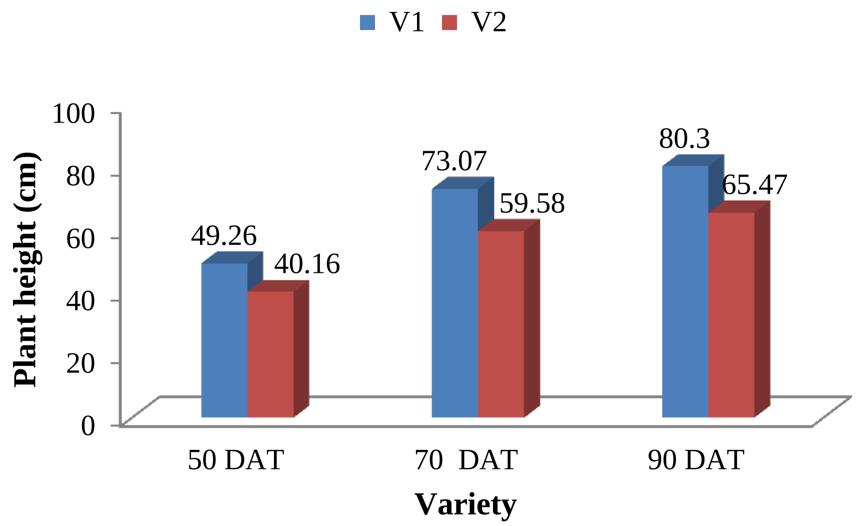

Figure 1. Effect of variety on plant height at different days after transplanting

[LSD $_{(0.05)}$ = 2.69, 3.99 and 4.38]

The plant height was significantly influenced by different doses of NEB and inorganic fertilizers (Appendix V)At 50, 70, and 90 DAT, the highest plant height (49.61, 73.58 and 80.86 cm at 50, 70 and 90 DAT, respectively) was recorded in T_5 (50%

recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest was measured at 50, 70, and 90 DAT (39.19, 58.13 and 63.89 cm at 50, 70 and 90 DAT, respectively) in T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Figure 2).

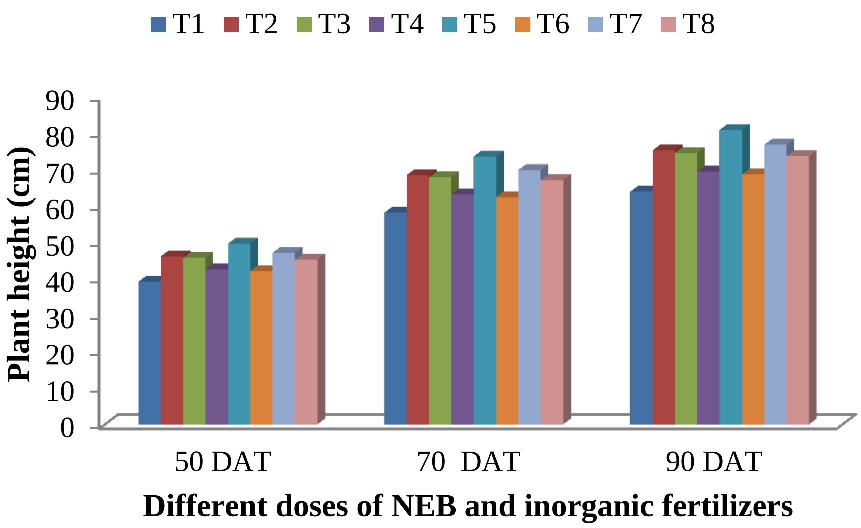

Figure 2. Effect of different doses of NEB and inorganic fertilizers on plant height at different days after transplanting [LSD $_{(0.05)}$ = 2.551, 4.396 and 2.042]

T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on plant height (Appendix V). The highest plant height (56.55, 83.88 and 92.18 cm at 50, 70 and 90 DAT, respectively) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 1). The lowest plant height (37.39, 55.46 and 60.94 cm at 50, 70 and 90 DAT, respectively) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 1. Interaction effect of variety and different doses of NEB and inorganic fertilizers on plant height at different DAT

Interaction	Plant height (cm) at		
	50 DAT	70 DAT	90 DAT
V_1T_1	41.00d-f	60.81de	66.83fg
V_1T_2	51.77b	76.80b	84.39bc
V_1T_3	50.61b	75.07b	82.50c
V_1T_4	44.44cd	65.92cd	72.44e
V_1T_5	56.55a	83.88a	92.18a
V_1T_6	46.22c	68.56c	75.34d
V_1T_7	53.33ab	79.10ab	86.93b
V_1T_8	50.17b	74.41b	81.77c
V_2T_1	37.39f	55.46e	60.94h
V_2T_2	40.55d-f	60.15de	66.10g
V_2T_3	40.89d-f	60.65de	66.65fg
V_2T_4	40.72d-f	60.40de	66.38fg
V_2T_5	42.67c-e	63.29cd	69.55f
V_2T_6	38.00f	56.36e	61.94h
V_2T_7	40.89d-f	60.65de	66.65fg
V_2T_8	40.22ef	59.66de	65.56g
$LSD_{(0.05)}$	3.608	5.701	2.888
CV (%)	4.97	9.98	11.98
LS	**	**	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.1.2 Number of leaves plant^{-1}

Variety showed statistically significant variation in respect of number of leaves plant^{-1} (Appendix VI). However between the variety, V_1 (ACI variety) showed the highest plant height (38.58, 84.82 and 95.30 cm at 50, 70 and 90 DAT, respectively). The lowest plant height (30.53, 67.11 and 75.41 cm at 50, 70 and 90 DAT, respectively) was observed in the V_2 (Singnath) variety (Figure 3).

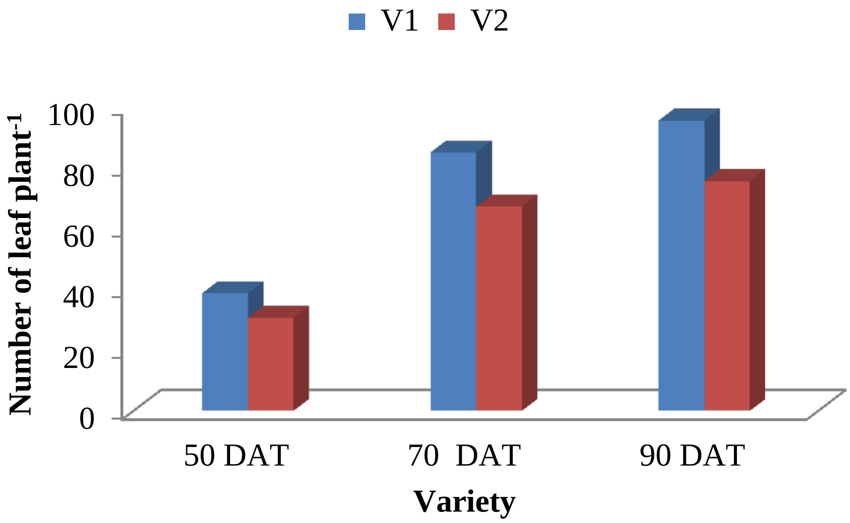

Figure 3. Effect of variety on number of leaves plant^{-1} at different days after transplanting [LSD $_{(0.05)}$ = 1.42, 3.11 and 3.50]

Number of leaves plant^{-1} was significantly influenced by different doses of NEB and inorganic fertilizers (Appendix VI). At 50, 70, and 90 DAT, the highest number of leaves plant^{-1} (41.04, 90.21, and 101.36, respectively) was recorded in T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest number of leaves plant^{-1} was measured at 50, 70, and 90 DAT (25.31, 55.63, and 62.51, respectively) in T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 2).

Table 2. Effect of NEB and inorganic fertilizers on number of leaves plant^{-1} at different DAT

Treatment	Number of leaves plant^{-1} at		
	50 DAT	70 DAT	90 DAT
T_1	25.31e	55.63f	62.51f
T_2	38.87ab	85.44b	96.01b
T_3	36.85b	81.01c	91.03c
T_4	30.67d	67.41e	75.74e
T_5	41.04a	90.21a	101.36a
T_6	30.83d	67.78e	76.16e
T_7	39.20ab	86.18b	96.83ab
T_8	33.68c	74.04d	83.19d
LSD $_{(0.05)}$	2.364	3.923	4.821
CV (%)	5.99	7.19	3.91
LS	**	**	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference, NS= Not Significant *= Significant at 5% level of Probability, **= Significant at 1% level of Probability
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on number of leaves plant^{-1} (Appendix VI). The highest number of leaves plant^{-1} (46.67, 102.59 and 115.27 cm at 50, 70 and 90 DAT, respectively) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 3). The lowest number of leaves plant^{-1} (23.61, 51.91 and 58.32 at 50, 70 and 90 DAT, respectively) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 3. Interaction effect of variety and different doses of NEB and inorganic fertilizers on number of leaves plant^{-1} at different DAT

Interaction	Number of leaves plant^{-1} at		
	50 DAT	70 DAT	90 DAT
V_1T_1	27.00f	59.36g	66.69h
V_1T_2	43.67ab	95.99b	107.86b
V_1T_3	42.33b	93.06b	104.56b
V_1T_4	33.67c-e	74.01de	83.16de
V_1T_5	46.67a	102.59a	115.27a
V_1T_6	34.33cd	75.48cd	84.80c-e
V_1T_7	44.00ab	96.73b	108.68ab
V_1T_8	37.00c	81.34c	91.39c
V_2T_1	23.61g	51.91h	58.32i
V_2T_2	34.07cd	74.90d	84.16c-e
V_2T_3	31.37de	68.97ef	77.49ef
V_2T_4	27.66f	60.81g	68.32gh
V_2T_5	35.41c	77.84cd	87.46cd
V_2T_6	27.34f	60.09g	67.52h
V_2T_7	34.41cd	75.64cd	84.99c-e
V_2T_8	30.36ef	66.74f	74.99fg
$LSD_{(0.05)}$	3.343	5.548	6.817
CV (%)	5.99	7.19	3.91
LS	**	**	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.1.3 Number of branches plant^{-1}

Significant variation was observed in respect of number of branches plant^{-1} due to variety (Appendix VII). However between the variety, V_1 (ACI variety) showed the highest number of branches plant^{-1} (9.59, 16.39 and 18.31 cm at 50, 70 and 90 DAT, respectively). The lowest number of branches plant^{-1} (6.58, 11.26 and 12.57cm at 50, 70 and 90 DAT, respectively) was observed in the V_2 (Singnath) variety (Figure 4).

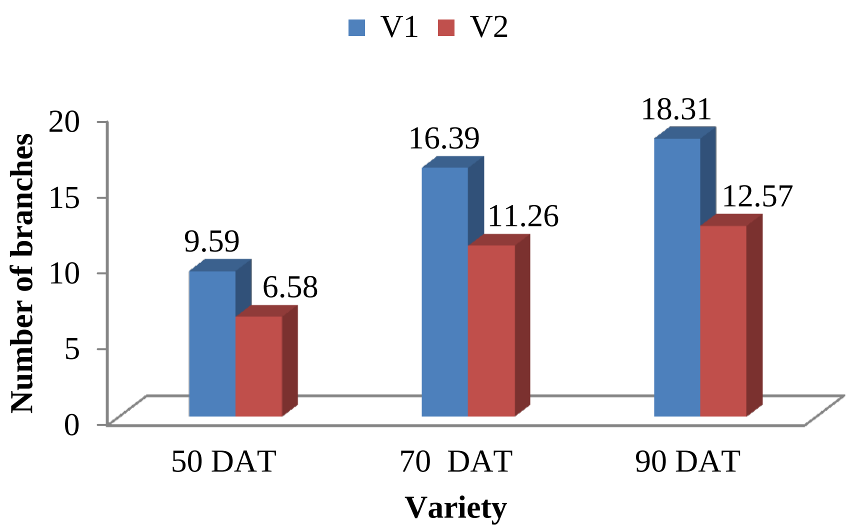

Figure 4. Effect of variety on number of branches plant^{-1} at different days after transplanting [LSD $_{(0.05)}$ = 0.52, 0.89 and 0.99]

The number of branches plant^{-1} had significant effect due to different doses of NEB and inorganic fertilizers (Appendix VII). At 50, 70, and 90 DAT, the highest number of branches plant^{-1} (10.00, 17.09, and 19.10 cm, respectively) was recorded in T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest was measured at 50, 70, and 90 DAT (6.17, 10.55, and 11.78 cm, respectively) in T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 4).

Table 4. Response of NEB and inorganic fertilizers on number of branches plant^{-1} at different DAT

Interaction	Number of branches plant^{-1} at		
	50 DAT	70 DAT	90 DAT
T_1	6.17f	10.55e	11.78e
T_2	8.93bc	15.27a-c	17.06bc
T_3	8.33c	14.24bc	15.92c
T_4	6.67ef	11.40e	12.73de
T_5	10.00a	17.09a	19.10a
T_6	7.17de	12.26de	13.69d
T_7	9.33ab	15.95ab	17.83ab
T_8	8.08cd	13.82cd	15.44c
LSD $_{(0.05)}$	0.923	1.818	1.707
CV (%)	10.02	4.00	4.33
LS	**	**	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, LSD$_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on number of branches plant^{-1} (Appendix VII). The highest number of branches plant^{-1} (11.67, 19.94 and 22.28 cm at 50, 70 and 90 DAT, respectively) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 5). The lowest number of branches plant^{-1} (5.33, 9.12 and 10.19 cm at 50, 70 and 90 DAT, respectively) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 5. Interaction effect of variety and different doses of NEB and inorganic fertilizers on number of branches plant^{-1} at different DAT

Interaction	Number of branches plant^{-1} at		
	50 DAT	70 DAT	90 DAT
V_1T_1	7.00d-g	11.97d-g	13.37c-f
V_1T_2	10.87a-c	18.57ab	20.76ab
V_1T_3	10.00bc	17.09b	19.10b
V_1T_4	7.67de	13.11de	14.64cd
V_1T_5	11.67a	19.94a	22.28a
V_1T_6	8.33d	14.25cd	15.92c
V_1T_7	11.33ab	19.37ab	21.65a
V_1T_8	9.83c	16.81bc	18.78b
V_2T_1	5.33h	9.12g	10.19g
V_2T_2	7.00d-g	11.97d-g	13.37c-f
V_2T_3	6.67e-h	11.40d-g	12.73d-g
V_2T_4	5.67gh	9.69fg	10.82fg
V_2T_5	8.33d	14.25cd	15.92c
V_2T_6	6.00f-h	10.26e-g	11.46e-g
V_2T_7	7.33d-f	12.54d-f	14.01c-e
V_2T_8	6.33e-h	10.83e-g	12.10d-g
$LSD_{(0.05)}$	1.307	2.571	2.414
CV (%)	10.02	4.00	4.33
LS	**	**	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability

CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,

**= Significant at 1% level of Probability

V_1= ACI variety (Happy)

V_2= BARI brinjal 7 (Singnath)

T_1= 50% recommended urea + 750 ml NEB ha^{-1}

T_2= 50% recommended urea + 1000 ml NEB ha^{-1}

T_3= 50% recommended urea + 1250 ml NEB ha^{-1}

T_4= 50% recommended urea + 1500 ml NEB ha^{-1}

T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}

T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}

T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}

T_8=100% recommended fertilizer

4.1.4 Stem diameter

Variety had non-significant effect in respect of stem diameter (Appendix VIII). However between the variety numerically, V_1 (ACI variety) showed the highest stem diameter (1.35, 1.76 and 1.92 cm at 50, 70 and 90 DAT, respectively) (Figure 5). The lowest stem diameter (1.30, 1.71 and 1.85 cm at 50, 70 and 90 DAT, respectively) was observed in the V_2 (Singnath) variety.

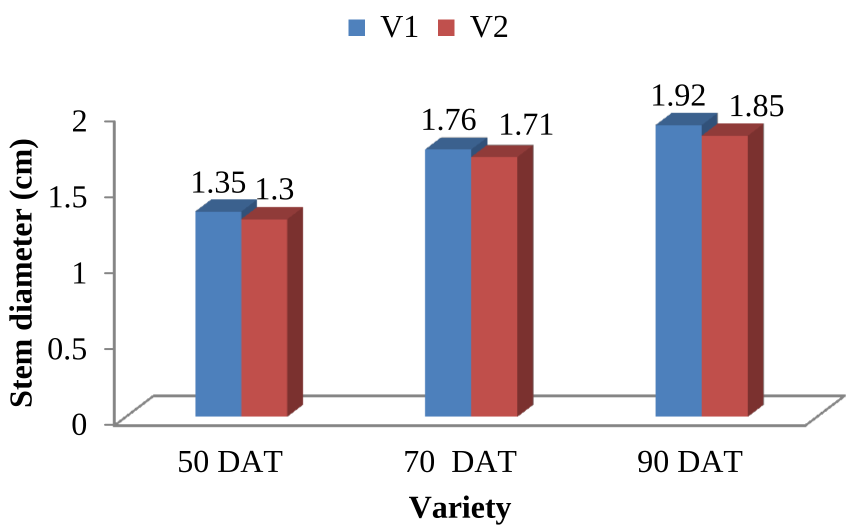

Figure 5. Effect of variety on stem diameter at different days after transplanting

[LSD $_{(0.05)}$ = 0.09, 0.08 and 0.13]

Stem diameter was significantly influenced by different doses of NEB and inorganic fertilizers (Appendix VIII). At 50, 70, and 90 DAT, the highest stem diameter (1.53, 2.00, and 2.18 cm, respectively) was recorded in T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest stem diameter was measured at 50, 70, and 90 DAT (1.15, 1.50, and 1.63 cm, respectively) in T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 6).

Table 6. Effect of NEB and inorganic fertilizers on stem diameter at different DAT

Treatments	Stem diameter at		
	50 DAT	**70 DAT**	**90 DAT**
T_1	1.15c	1.50d	1.63c
T_2	1.33b	1.74bc	1.89b
T_3	1.35b	1.77bc	1.92b
T_4	1.17c	1.53d	1.66c
T_5	1.53a	2.00a	2.18a
T_6	1.28bc	1.68c	1.82bc
T_7	1.43ab	1.87ab	2.04ab
T_8	1.37b	1.79bc	1.94b
LSD $_{(0.05)}$	0.139	0.139	0.207
CV (%)	7.93	9.32	6.72
LS	*	**	*

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference
*= Significant at 5% level of Probability, **= Significant at 1% level of Probability
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on stem diameter (Appendix VIII). The highest stem diameter (1.63, 2.14 and 2.29 cm at 50, 70 and 90 DAT, respectively) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 7). The lowest stem diameter (1.03, 1.35 and 1.47 cm at 50, 70 and 90 DAT, respectively) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 7. Interaction effect of variety and different doses of NEB and inorganic fertilizers on stem diameter at different DAT

Interaction	Stem diameter (cm) at		
	50 DAT	70 DAT	90 DAT
V_1T_1	1.03g	1.35g	1.47f
V_1T_2	1.47a-c	1.92a-c	2.08a-c
V_1T_3	1.37b-d	1.79b-d	1.94a-c
V_1T_4	1.23d-g	1.61d-g	1.75c-f
V_1T_5	1.63a	2.14a	2.29a
V_1T_6	1.27c-f	1.66c-f	1.80c-e
V_1T_7	1.53ab	2.00ab	2.18ab
v_1t_8	1.30c-e	1.70c-e	1.85b-e
V_2T_1	1.27c-f	1.66c-f	1.80c-e
V_2T_2	1.07fg	1.40fg	1.51ef
V_2T_3	1.33b-d	1.74b-d	1.90b-d
V_2T_4	1.10e-g	1.44e-g	1.56d-f
V_2T_5	1.59a	2.08a	2.24a
V_2T_6	1.30c-e	1.70c-e	1.85b-e
V_2T_7	1.33b-d	1.74b-d	1.89b-d
V_2T_8	1.43a-d	1.87a-d	2.03 a-c
$LSD_{(0.05)}$	0.197	0.252	0.293
CV (%)	7.93	9.32	6.72
LS	*	**	*

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
*= Significant at 5% level of Probability, **= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.1.5 Days to first flowering (days)

Days to first flowering showed significant variation due to variety (Appendix IX). However between the variety, V_2 (Singnath) showed the longest duration to first flowering (45.79 days). The shortest duration to first flowering of plant (43.25 days) was observed in the variety V_1 (ACI variety) (Figure 6).

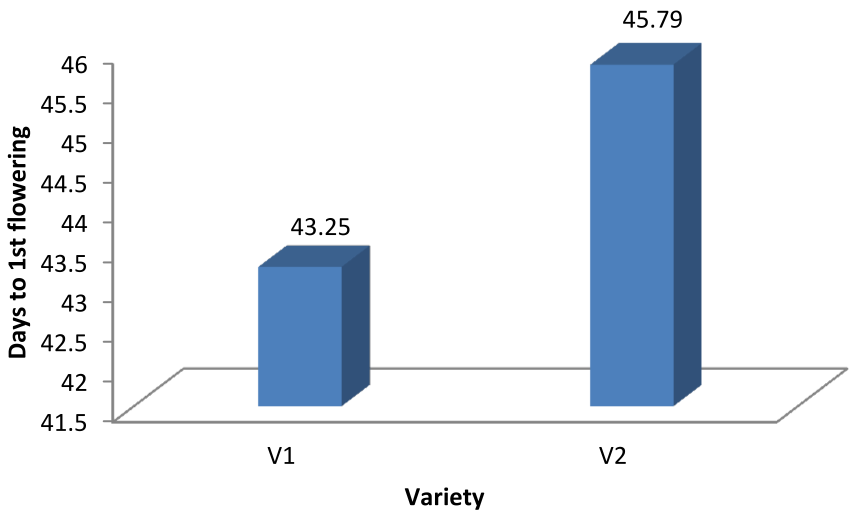

Figure 6. Effect of variety on days to first flowering [LSD $_{(0.05)}$ =0.34]

In respects of days to first flowering of brinjal remarkable variation was noted (Appendix IX) against different doses of NEB and inorganic fertilizers. There was an increasing trend of days to first flowering found with the decreasing of N accumulation in soil by the treatment. The longest (50.83 days) period was required for the plant produced from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment and the shortest (38.33 days) was required for the plant produced from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Figure 7).

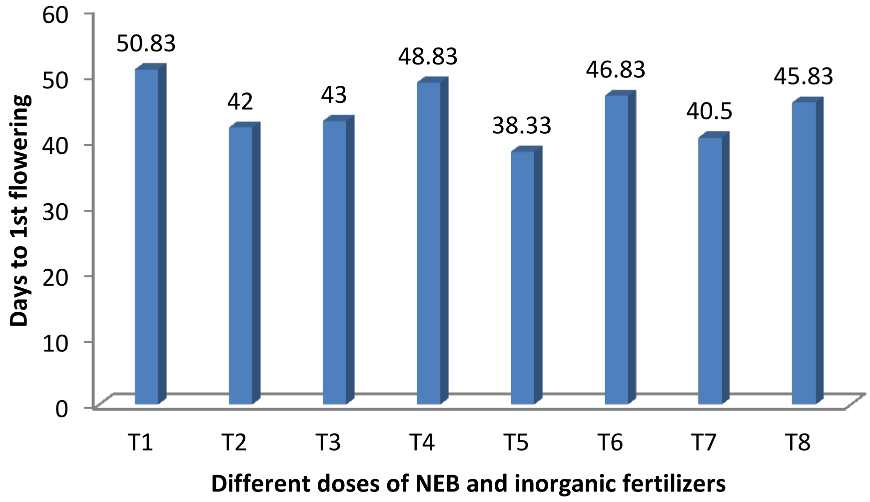

Figure 7. Effect of different doses of NEB and inorganic fertilizers on days to first flowering [LSD $_{(0.05)}$ = 2.578]

T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on days to first flowering (Appendix IX). The longest duration to first flowering (52.00 days) was observed in $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}). The shortest duration to first flowering of plant (37.00 days) was observed $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 8).

Table 8. Interaction effect of variety and different doses of NEB and inorganic fertilizers on days to first flowering

Interaction	Days to first flowering
V_1T_1	49.67ab
V_1T_2	40.67f-h
V_1T_3	41.67e-g
V_1T_4	47.33b-d
V_1T_5	37.00h
V_1T_6	45.33c-e
V_1T_7	39.67gh
V_1T_8	44.67c-f
V_2T_1	52.00a
V_2T_2	43.33d-g
V_2T_3	44.33c-f
V_2T_4	50.33ab
V_2T_5	39.67gh
V_2T_6	48.33a-c
V_2T_7	41.33e-g
V_2T_8	47.00b-d
$LSD_{(0.05)}$	3.645
CV (%)	4.49
LS	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.1.6 Number of fruits plant^{-1}

Number of fruits plant^{-1} showed significant variation due to variety (Appendix X). However between the variety, V_1 (ACI variety) showed the highest number of fruits plant^{-1} (14.31). The lowest number of fruits plant^{-1} (12.40) was observed in the V_2 (Singnath) variety (Figure 8).

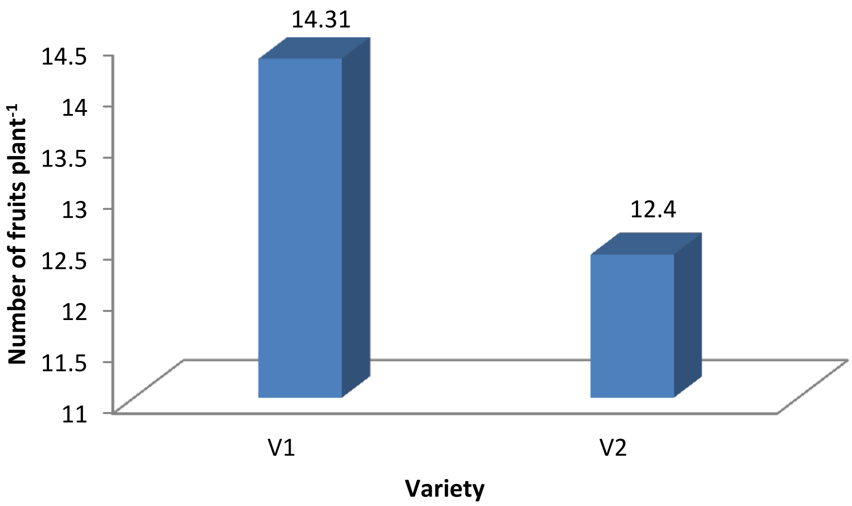

Figure 8. Effect of variety on number of fruits plant^{-1} of brinjal [LSD $_{(0.05)}$ = 0.11]

In respects of number of fruits plant^{-1} of brinjal remarkable variation was noted (Appendix X) against different doses of NEB and inorganic fertilizers. There was an increasing trend of number of fruits plant^{-1} found with the decreasing of N accumulation in soil by the treatment. The highest number of fruits plant^{-1} (16.10) was found for the plant produced from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) and the lowest number of fruits plant^{-1} (10.99) was found for the plant produced from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Figure 9).

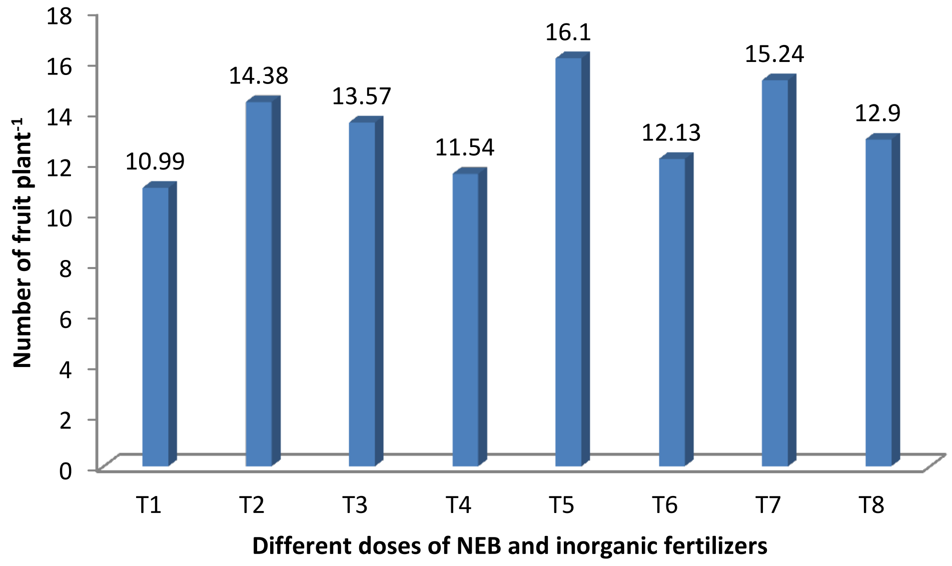

Figure 9. Effect of different doses of NEB and inorganic fertilizers on number of fruits plant^{-1} [LSD $_{(0.05)}$ = 0.626]

T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on number of fruits plant^{-1} (Appendix X). The highest number of fruits plant^{-1} (17.26) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 9). The lowest number of fruits plant^{-1} of plant (10.40) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 9. Interaction effect of variety and different doses of NEB and inorganic fertilizers on Number of fruits plant^{-1}

Interaction	Number of fruits plant^{-1}
V_1T_1	11.59hi
V_1T_2	15.14b
V_1T_3	14.67b-d
V_1T_4	12.49gh
V_1T_5	17.26a
V_1T_6	12.96fg
V_1T_7	16.43a
V_1T_8	13.96de
V_2T_1	10.40j
V_2T_2	13.61ef
V_2T_3	12.48gh
V_2T_4	10.59j
V_2T_5	14.94bc
V_2T_6	11.29ij
V_2T_7	14.05c-e
V_2T_8	11.84hi
LSD $_{(0.05)}$	0.885
CV (%)	8.44
LS	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.1.7 Fruit length

Significant variation was found due to variety on fruit length of brinjal (Appendix X). Variety V_1 (ACI variety) showed the highest fruit length of brinjal (29.81 cm). The lowest fruit length of brinjal (27.49 cm) was observed in the V_2 (Singnath) variety (Table 10).

Table 10. Effect of variety on fruit length, fruit breadth and length breadth ratio

Variety	Fruit length (cm)	Fruit breadth (cm)	Length breadth ratio
V_1	29.81a	15.44a	1.93
V_2	27.49b	14.56b	1.88
LSD $_{(0.05)}$	0.15	0.07	0.18
CV (%)	5.47	7.43	3.49
LS	**	**	NS

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference, NS= Not Significant, **= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)

Fruit length of brinjal was found significantly different against different doses of NEB and inorganic fertilizers (Appendix X). The highest fruit length (35.45 cm) of brinjal was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest fruit length of brinjal (24.17 cm) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 11).

Table 11. Effect of NEB and inorganic fertilizers on fruit length, fruit breadth and length breadth ratio

Treatments	Fruit length (cm)	Fruit breadth (cm)	Length breadth ratio
T_1	24.17f	12.94g	1.87bc
T_2	29.88c	15.49c	1.93ab
T_3	28.15d	14.98d	1.88bc
T_4	26.02e	13.75f	1.89bc
T_5	35.45a	17.70a	2.01a
T_6	27.43d	14.38e	1.91bc
T_7	31.61b	16.29b	1.94ab
T_8	26.49e	14.45e	1.83c
$LSD_{(0.05)}$	0.853	0.385	0.025
CV (%)	5.47	7.43	3.49
LS	**	**	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on fruit length of brinjal (Appendix X). The highest fruit length of brinjal (36.89 cm) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}). The lowest fruit length of brinjal (23.18 cm) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}) (Table 12).

Table 12. Interaction effect of variety and different doses of NEB and inorganic fertilizers on fruit length, fruit breadth and length breadth ratio

Interaction	Fruit length (cm)	Fruit breadth (cm)	Length breadth ratio
V_1T_1	25.15hi	13.33h	1.89
V_1T_2	31.09c	15.94c	1.95
V_1T_3	29.29de	15.42cd	1.90
V_1T_4	27.08g	14.15fg	1.91
V_1T_5	36.89a	18.22a	2.03
V_1T_6	28.55ef	14.80e	1.93
V_1T_7	32.89b	16.76b	1.96
V_1T_8	27.57fg	14.88de	1.85
V_2T_1	23.18j	12.56i	1.84
V_2T_2	28.67ef	15.04de	1.91
V_2T_3	27.01g	14.55ef	1.85
V_2T_4	24.96i	13.35h	1.87
V_2T_5	34.01b	17.18b	1.98
V_2T_6	26.32gh	13.95g	1.88
V_2T_7	30.33cd	15.81c	1.92
V_2T_8	25.42hi	14.03fg	1.81
$LSD_{(0.05)}$	1.204	0.545	0.205
CV (%)	5.47	7.43	3.49
LS	**	**	NS

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference, NS= Not Significant, **= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.1.8 Fruit breadth

Significant variation was found due to variety on fruit breadth of brinjal (Appendix X). Variety V_1 (ACI variety) showed the highest fruit breadth of brinjal (15.44 cm). The lowest fruit breadth of brinjal (14.56 cm) was observed in the V_2 (Singnath) variety (Table 10).

Fruit breadth of brinjal was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix X). The highest fruit breadth (17.70 cm) of brinjal was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest fruit length of brinjal (12.94 cm) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 11).

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on fruit breadth of brinjal (Appendix X). The highest fruit breadth of brinjal (18.22 cm) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}). The lowest fruit breadth of brinjal (13.35 cm) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}) (Table 12).

4.1.9 Fruit length breadth ratio

Fruit length breadth ratio found significant variation due to variety (Appendix X). Variety V_1 (ACI variety) showed the highest fruit length breadth ratio ((1.93) and the lowest fruit fruit length breadth ratio (1.88) was observed in the V_2 (Singnath) variety (Table 10).

Fruit length breadth ratio was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix X). The highest fruit length breadth ratio (2.01) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest fruit length breadth ratio (1.83) was found from T_8 treatment (Table 11).

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on fruit length breadth ratio (Appendix X). The highest fruit length breadth ratio (2.03) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}). The lowest fruit length breadth ratio (1.81) was observed $V_2 \times T_8$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}) (Table 12).

4.1.10 Average fruit weight (g)

Average fruit weight (g) showed significant variation due to variety (Appendix X). However between the variety, V_1 (ACI variety) showed the highest average fruit weight (88.61 g). The lowest average fruit weight (75.70 g) was observed in the V_2 (Singnath) variety (Figure 10).

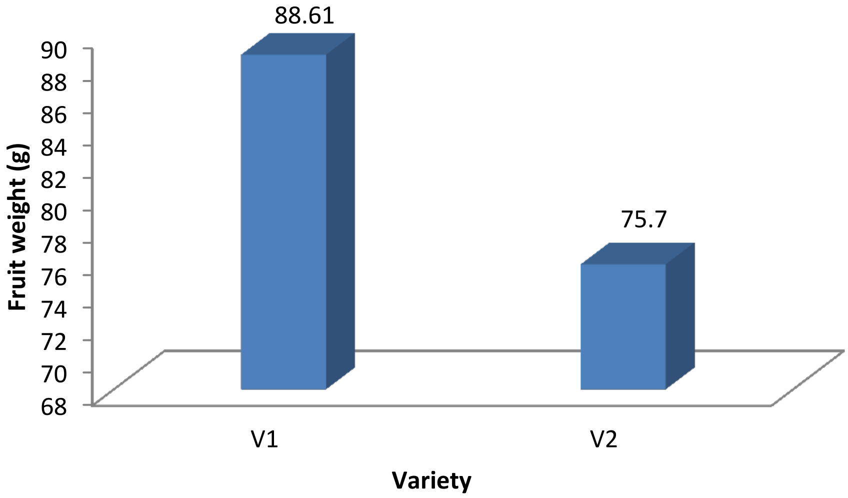

Figure 10. Effect of variety on average fruit weight (g) [LSD $_{(0.05)}$ = 0.25]

Weight of fruits plant^{-1} of brinjal was found significantly varied (Appendix X) against different doses of NEB and inorganic fertilizers. Results demonstrated that, the highest average fruit weight (94.27 g) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest weight of fruits plant^{-1} (69.16 g) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Figure 11). More absorption of soil nitrogen by plant may be the main reason for higher weight of fruits plant^{-1}.

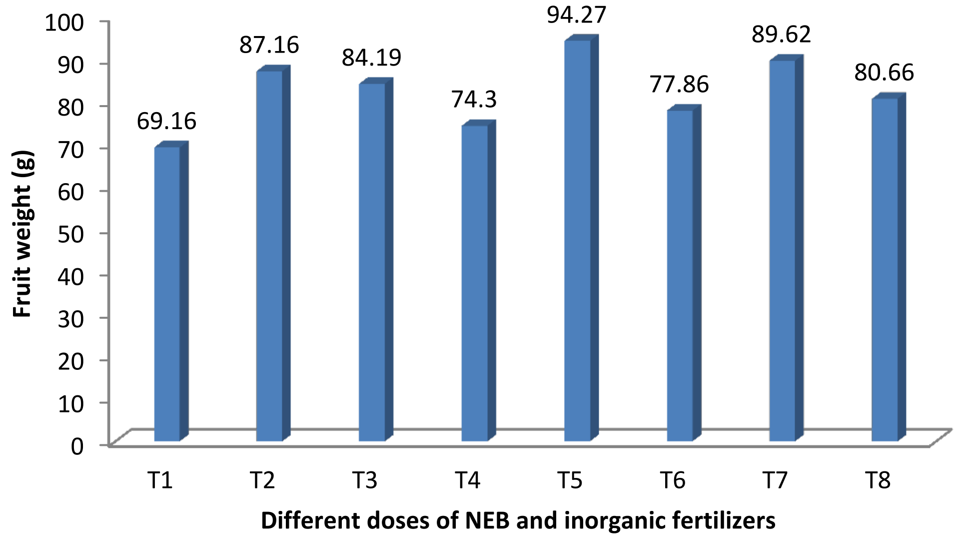

Figure 11. Effect of different doses of NEB and inorganic fertilizers on average fruit weight (g) [LSD $_{(0.05)}$ = 3.00]

T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on average fruit weight (g) (Appendix X). The highest average fruit weight (100.72 g) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 13). The lowest average fruit weight of plant (64.22 g) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 13. Interaction effect of variety and different doses of NEB and inorganic fertilizers on average fruit weight (g)

Interaction	Average fruit weight (g)
V_1T_1	74.11hi
V_1T_2	94.57bc
V_1T_3	91.24cd
V_1T_4	79.81fg
V_1T_5	100.72a
V_1T_6	84.14ef
V_1T_7	97.15ab
V_1T_8	87.14de
V_2T_1	64.22k
V_2T_2	79.74fg
V_2T_3	77.15gh
V_2T_4	68.80j
V_2T_5	87.82de
V_2T_6	71.59ij
V_2T_7	82.10f
V_2T_8	74.18hi
LSD $_{(0.05)}$	4.245
CV (%)	7.45
LS	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.1.11 Yield (t ha^{-1})

Yield (t ha^{-1}) showed significant variation due to variety (Appendix X). However between the variety, V_1 (ACI variety) showed the highest yield (25.67 t ha^{-1}). The lowest weight of yield (18.99 t ha^{-1}) was observed in the V_2 (Singnath) variety (Figure 12).

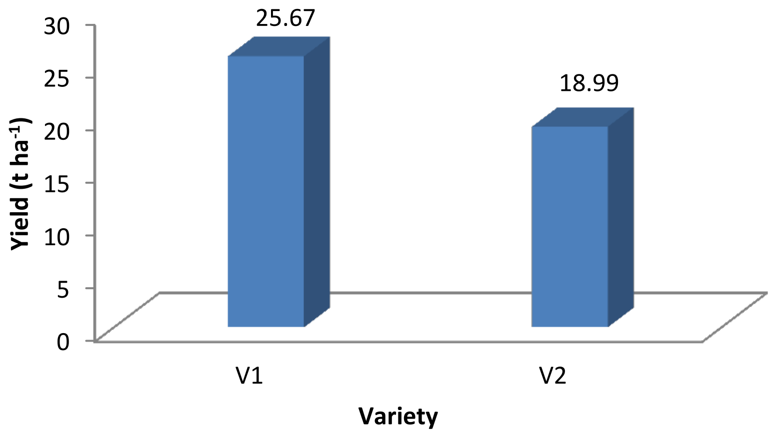

Figure 12. Effect of variety on yield of brinajl [LSD $_{(0.05)}$ =0.21]

Yield of brinjal was found significantly varied (Appendix X) against different doses of NEB and inorganic fertilizers. Results demonstrated that, the highest yield (30.50 t ha^{-1}) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest yield (15.27 t ha^{-1}) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Figure 13). The higher weight of brinjal per plant and higher average weight of fruit may be the main reason for higher yield ton per hectare.

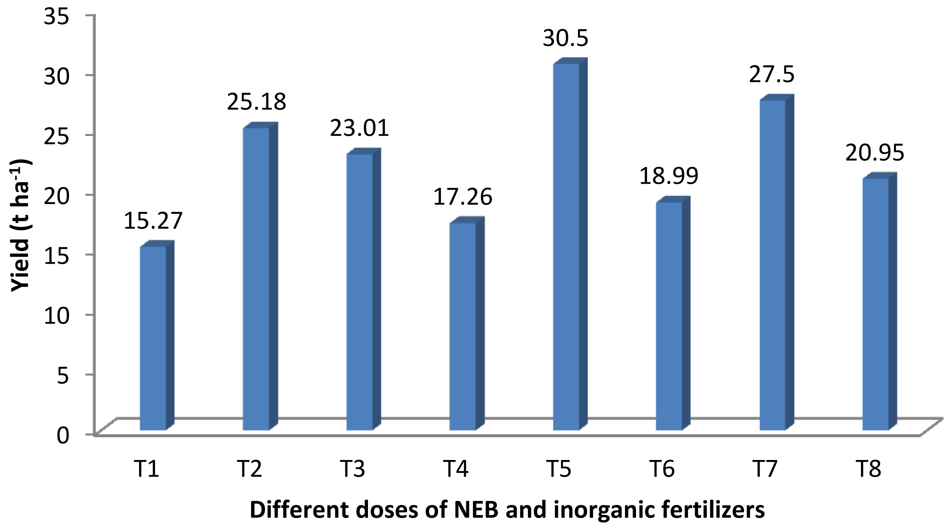

Figure 13. Effect of different doses of NEB and inorganic fertilizers on yield of brinjal [LSD $_{(0.05)}$ = 1.293]

T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on yield (t ha^{-1}) (Appendix X). The highest yield (34.76 t ha^{-1}) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 14). The lowest yield (14.36 t ha^{-1}) of plant was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 14. Interaction effect of variety and different doses of NEB and inorganic fertilizers on Yield

Interaction	Yield t ha^{-1}
V_1T_1	17.18j
V_1T_2	28.65c
V_1T_3	26.76d
V_1T_4	19.95gh
V_1T_5	34.76a
V_1T_6	21.81fg
V_1T_7	31.93b
V_1T_8	24.33e
V_2T_1	13.36l
V_2T_2	21.71fg
V_2T_3	19.26hi
V_2T_4	14.57kl
V_2T_5	26.24d
V_2T_6	16.16jk
V_2T_7	23.07ef
V_2T_8	17.57ij
LSD $_{(0.05)}$	1.828
CV (%)	6.42
LS	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.2 Seed Characterizes

4.2.1 1000-seeds weight (g)

Significant variation was found due to variety on 1000-seeds weight (Appendix XI). The 1000-seeds weight (6.02 g) was observed variety V_1 (ACI variety) and the lowest 1000-seeds weight (5.36 g) was observed in the V_2 (Singnath) variety (Figure 14).

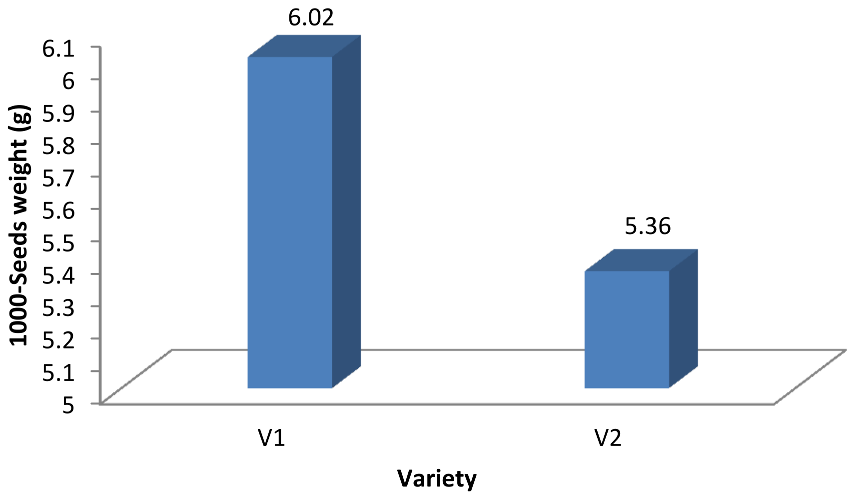

Figure 14. Effect of variety on 1000-seeds weight of brinjal [LSD $_{(0.05)}$ = 0.04]

1000-seeds weight was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XI). The highest 1000-seeds weight (6.69 g) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest 1000-seeds weight (4.60 g) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Figure 15).

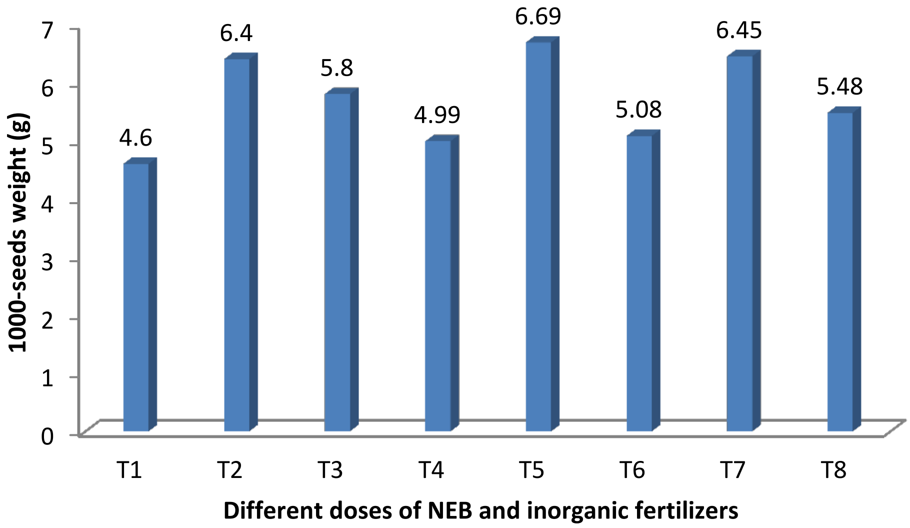

Figure 15. Effect of different doses of NEB and inorganic fertilizers on 1000-seeds weight of brinjal [LSD $_{(0.05)}$ = 0.256]

T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on 1000-seeds weight of brinjal (Appendix XI). The highest 1000-seeds weight (7.08 g) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 15). The lowest 1000-seeds weight (4.69 g) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 15. Interaction effect of variety and different doses of NEB and inorganic fertilizers on 1000-seeds weight

Interaction	1000-seeds weight (g)
V_1T_1	4.87ef
V_1T_2	6.78a
V_1T_3	6.13bc
V_1T_4	5.28d
V_1T_5	7.08a
V_1T_6	5.38d
V_1T_7	6.83a
V_1T_8	5.80c
V_2T_1	4.33g
V_2T_2	6.03bc
V_2T_3	5.46d
V_2T_4	4.69f
V_2T_5	6.30b
V_2T_6	4.79f
V_2T_7	6.08bc
V_2T_8	5.16de
LSD $_{(0.05)}$	0.337
CV (%)	3.43
LS	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.2.2 Germination percentage

Significant variation was found due to variety on germination percentage of brinjal seed (Appendix XI). The germination percentage of brinjal seed (78.92 %) was observed variety V_1 (ACI variety) and the lowest germination percentage of brinjal seed (71.92 %) was observed in the V_2 (Singnath) variety (Figure 16).

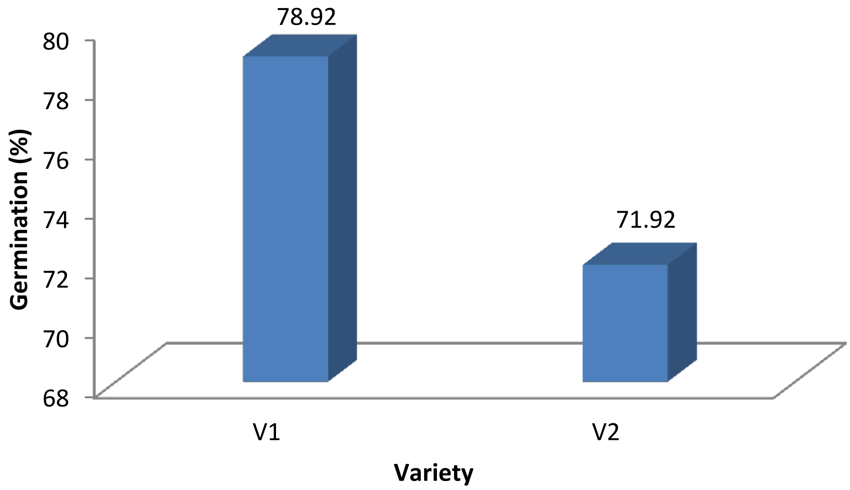

Figure 16. Effect of variety on germination percentage of brinjal [LSD $_{(0.05)}$ = 0.12]

Germination percentage of brinjal seed was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XI). The highest germination percentage of brinjal seed (81.83 %) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest germination percentage of brinjal seed (69.17 %) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Figure 17).

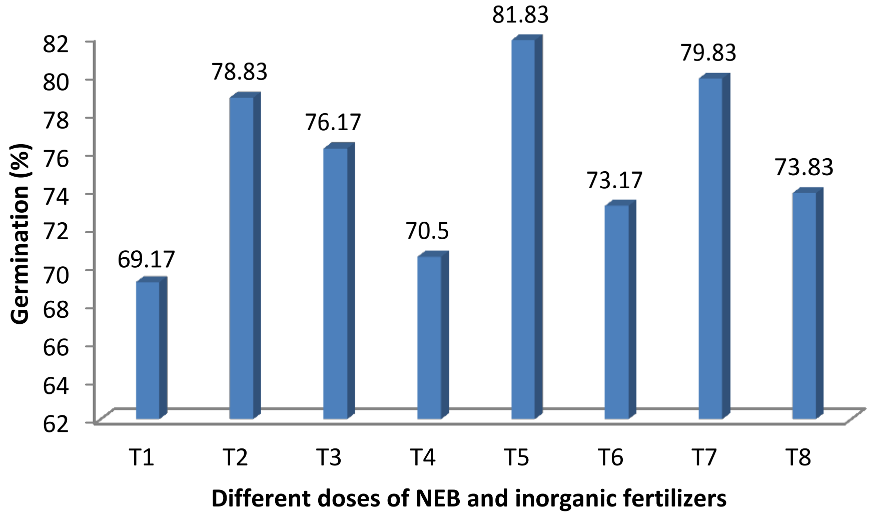

Figure 17. Effect of different doses of NEB and inorganic fertilizers on germination percentage of brinjal [LSD $_{(0.05)}$ = 0.719]

T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect germination percentage of brinjal seed (Appendix XI). The highest germination percentage of brinjal seed (85.33 %) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 16). The lowest germination percentage of brinjal seed (65.67 %) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 16. Interaction effect of variety and different doses of NEB and inorganic fertilizers on Germination percentage

Interaction	Germination percentage
V_1T_1	72.67h
V_1T_2	82.33b
V_1T_3	79.67c
V_1T_4	74.00g
V_1T_5	85.33a
V_1T_6	76.67e
V_1T_7	83.33b
V_1T_8	77.33de
V_2T_1	65.67k
V_2T_2	75.33f
V_2T_3	72.67h
V_2T_4	67.00j
V_2T_5	78.33d
V_2T_6	69.67i
V_2T_7	76.33ef
V_2T_8	70.33i
LSD $_{(0.05)}$	1.017
CV (%)	3.98
LS	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.2.3 Seed vigor index

Significant variation was found due to variety on seed vigor index (Appendix XI). The highest seed vigor index (1254.81) was observed in variety V_1 (ACI variety) and the lowest seed vigor index (1174.58) was observed in the V_2 (Singnath) variety (Figure 18).

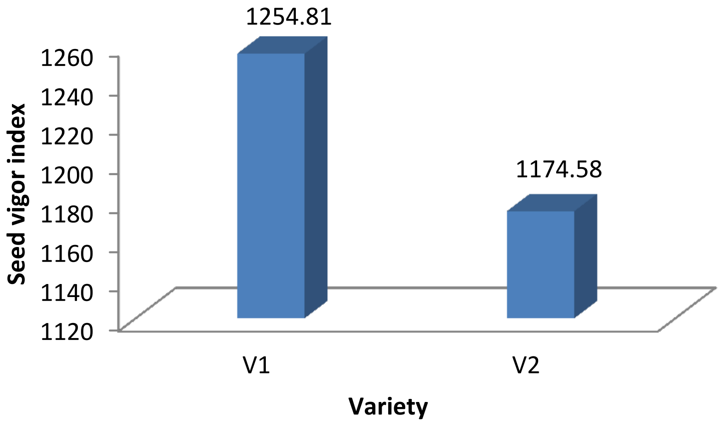

Figure 18. Effect of variety on seed vigor index of brinjal [LSD $_{(0.05)}$ = 7.818]

Seed vigor index was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XI). The highest seed vigor index (1496.66) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest seed vigor index (1004.16) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Figure 19) .

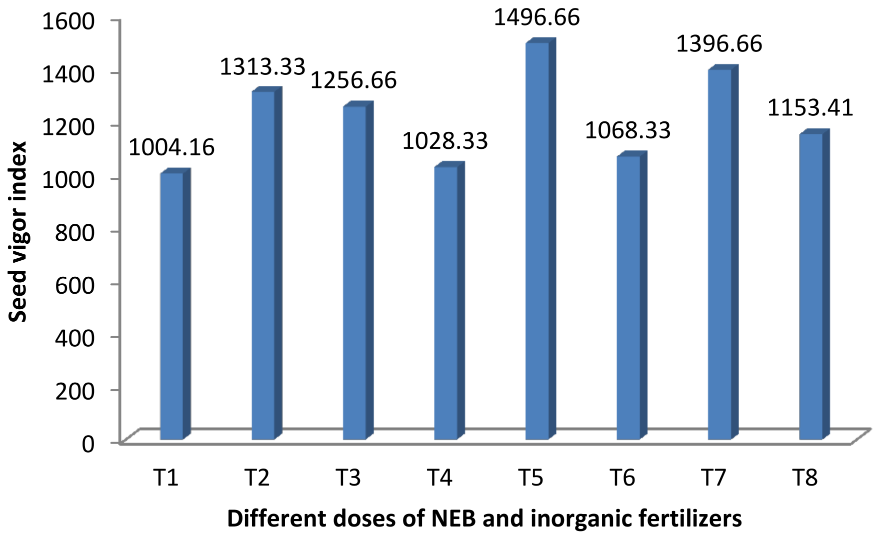

Figure 19. Effect of different doses of NEB and inorganic fertilizers on seed vigor index [LSD $_{(0.05)}$ = 45.16]

T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on seed vigor index (Appendix XI). The highest seed vigor index (1546.66) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 17). The lowest seed vigor index (970.00) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}).

Table 17. Interaction effect of variety and different doses of NEB and inorganic fertilizers on seed vigor index

Interaction	Seed vigor index
V_1T_1	1038.33h-j
V_1T_2	1356.66c
V_1T_3	1296.66cd
V_1T_4	1063.33g-i
V_1T_5	1546.66a
V_1T_6	1103.33gh
V_1T_7	1443.33b
V_1T_8	1190.16f
V_2T_1	970.00j
V_2T_2	1270.00de
V_2T_3	1216.66ef
V_2T_4	993.33j
V_2T_5	1446.67b
V_2T_6	1033.33ij
V_2T_7	1350.00c
V_2T_8	1116.67g
$LSD_{(0.05)}$	63.87
CV (%)	8.77
LS	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

4.2.4 Shoot length

Significant variation was found due to variety on shoot length (Appendix XII). The shoot length (3.08 cm) was observed variety V_1 (ACI variety) and the lowest shoot length (2.81 cm) was observed in the V_2 (Singnath) variety (Table 18).

Table 18. Effect of variety on shoot length, root length and shoot root length ratio

Variety	Shoot length (cm)	Root length (cm)	Shoot root length ratio
V_1	3.086 a	4.64a	0.67
V_2	2.809 b	4.13b	0.68
LSD $_{(0.05)}$	0.011	0.015	0.03
CV (%)	4.46	3.34	6.38
LS	*	**	NS

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)

Shoot length was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XII). The highest shoot length (4.14 cm) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest shoot length (2.14 cm) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 19).

Table 19. Effect of NEB and inorganic fertilizers on shoot length, root length and shoot root length ratio

Variety	Shoot length (cm)	Root length (cm)	Shoot root length ratio
T_1	2.25g	3.15g	0.71
T_2	3.23c	4.86c	0.67
T_3	2.81d	4.26d	0.66
T_4	2.45f	3.54f	0.69
T_5	3.96a	6.06a	0.65
T_6	2.59e	3.92e	0.66
T_7	3.53b	5.25b	0.67
T_8	2.74d	4.04e	0.68
LSD $_{(0.05)}$	0.083	0.124	0.112
CV (%)	4.46	3.34	6.38
LS	**	**	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability
CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,
**= Significant at 1% level of Probability
T_1= 50% recommended urea + 750 ml NEB ha^{-1}
T_2= 50% recommended urea + 1000 ml NEB ha^{-1}
T_3= 50% recommended urea + 1250 ml NEB ha^{-1}
T_4= 50% recommended urea + 1500 ml NEB ha^{-1}
T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}
T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}
T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}
T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on shoot length (Appendix XII). The highest shoot length (4.14 cm) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}). The lowest shoot length (2.14 cm) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}) (Table 20).

Table 20. Interaction effect of variety and different doses of NEB and inorganic fertilizers on shoot length, root length and shoot root length ratio

Interaction	Shoot length (cm)	Root length (cm)	Shoot root length ratio
V_1T_1	2.35ij	3.33i	0.71
V_1T_2	3.38c	5.14c	0.66
V_1T_3	2.94e	4.50e	0.65
V_1T_4	2.57gh	3.75h	0.69
V_1T_5	4.14a	6.41a	0.64
V_1T_6	2.71f	4.15fg	0.65
V_1T_7	3.69b	5.56b	0.66
V_1T_8	2.87e	4.27f	0.67
V_2T_1	2.14k	2.97j	0.72
V_2T_2	3.08d	4.58e	0.67
V_2T_3	2.68fg	4.01g	0.67
V_2T_4	2.34j	3.33i	0.70
V_2T_5	3.77b	5.71b	0.66
V_2T_6	2.47hi	3.69h	0.67
V_2T_7	3.36c	4.94d	0.68
V_2T_8	2.62fg	3.80h	0.69
$LSD_{(0.05)}$	0.117	0.174	0.036
CV (%)	4.46	3.34	6.38
LS	*	**	NS

Values with common letter (s) within a column do not differ significantly as 5% level of probability

CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference, NS= Not Significant *= Significant at 5% level of Probability, **= Significant at 1% level of Probability

V_1= ACI variety (Happy)

V_2= BARI brinjal 7 (Singnath)

T_1= 50% recommended urea + 750 ml NEB ha^{-1}

T_2= 50% recommended urea + 1000 ml NEB ha^{-1}

T_3= 50% recommended urea + 1250 ml NEB ha^{-1}

T_4= 50% recommended urea + 1500 ml NEB ha^{-1}

T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}

T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}

T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}

T_8=100% recommended fertilizer

4.2.5 Root length

Significant variation was found due to variety on root length (Appendix XII). Variety V_1 (ACI variety) showed the highest root length (4.64 cm) and the lowest root length (4.13 cm) was observed in the V_2 (Singnath) variety (Table 18).

Root length was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XII). The highest root length (6.06 cm) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest root length (3.15 cm) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 19).

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on root length (Appendix XII). The highest root length of brinjal (6.41 cm) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}). The lowest root length (2.97 cm) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}) (Table 20).

4.2.6 Shoot root length ratio

Shoot root length ratio found significant variation due to variety (Appendix XII). The highest shoot root length ratio (0.67) was observed in V_2 (Singnath) and the lowest shoot root length ratio (0.68) was observed in V_1 (ACI variety) (Table 18).

Shoot root length ratio was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XII). The highest shoot root length ratio (0.71) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) whereas the lowest shoot root length ratio (0.65) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) treatment (Table 19).

Interaction effect between variety and different doses of NEB and inorganic fertilizers found non-significant effect on shoot root length ratio (Appendix XII and Table 20).

4.2.7 Shoot dry weight

Non-significant variation was found due to variety on shoot dry weight (Appendix XIII). The shoot dry weight (0.11 g) was observed variety V_1 (ACI variety) and the lowest shoot dry weight (0.09 g) was observed in the V_2 (Singnath) variety (Table 21).

Table 21. Effect of variety on shoot dry weight, root dry weight and root shoot dry weight ratio

Variety	Shoot dry weight (g)	Root dry weight (g)	Root shoot dry weight ratio
V_1	0.11	0.31	0.34
V_2	0.09	0.28	0.34
LSD $_{(0.05)}$	0.05	0.061	0.02
CV (%)	5.16	4.65	7.03
LS	NS	NS	NS

CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference, NS= Not Significant
V_1= ACI variety (Happy)
V_2= BARI brinjal 7 (Singnath)

Shoot dry weight was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XIII). The highest shoot dry weight (0.013 g) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest shoot dry weight (0.08 g) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 22).

Table 22. Effect of NEB and inorganic fertilizers on shoot dry weight, root dry weight and root shoot dry weight ratio

Variety	Shoot dry weight (g)	Root dry weight (g)	Root shoot dry weight ratio
T_1	0.08d	0.21g	0.36a
T_2	0.11bc	0.33c	0.32de
T_3	0.10b-d	0.28d	0.34cd
T_4	0.08cd	0.24f	0.36ab
T_5	0.13a	0.41a	0.32e
T_6	0.09cd	0.26b	0.34cd
T_7	0.12ab	0.35de	0.32de
T_8	0.09b-d	0.27b	0.35bc
$LSD_{(0.05)}$	0.020	0.016	0.011
CV (%)	5.16	4.65	7.03
LS	**	**	**

Values with common letter (s) within a column do not differ significantly as 5% level of probability

CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference,

**= Significant at 1% level of Probability

T_1= 50% recommended urea + 750 ml NEB ha^{-1}

T_2= 50% recommended urea + 1000 ml NEB ha^{-1}

T_3= 50% recommended urea + 1250 ml NEB ha^{-1}

T_4= 50% recommended urea + 1500 ml NEB ha^{-1}

T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}

T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}

T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}

T_8=100% recommended fertilizer

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted non-significant effect on shoot dry weight (Appendix XIII). The highest shoot dry weight (0.14 g) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}). The lowest shoot dry weight (0.07 g) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}) (Table 23).

Table 23. Interaction effect of variety and different doses of NEB and inorganic fertilizers on shoot dry weight, root dry weight and root shoot dry weight ratio

Interaction	Shoot dry weight (g)	Root dry weight (g)	Root shoot dry weight ratio
V_1T_1	0.08	0.22j	0.36
V_1T_2	0.11	0.34c	0.33
V_1T_3	0.10	0.30de	0.33
V_1T_4	0.09	0.25h	0.35
V_1T_5	0.14	0.43a	0.33
V_1T_6	0.09	0.28e-g	0.33
V_1T_7	0.13	0.37b	0.34
V_1T_8	0.10	0.29d-f	0.34
V_2T_1	0.07	0.20j	0.37
V_2T_2	0.10	0.31d	0.32
V_2T_3	0.09	0.27f-h	0.34
V_2T_4	0.08	0.22ij	0.36
V_2T_5	0.12	0.38b	0.32
V_2T_6	0.08	0.25hi	0.34
V_2T_7	0.11	0.33c	0.32
V_2T_8	0.09	0.25gh	0.35
LSD $_{(0.05)}$	0.048	0.023	0.036
CV (%)	5.16	4.65	7.03
LS	NS	*	NS

Values with common letter (s) within a column do not differ significantly as 5% level of probability

CV= Coefficient of variation, LS= Level of significance, $LSD_{(0.05)}$= Least significant difference, NS= Not Significant, *= Significant at 5% level of Probability,

V_1= ACI variety (Happy)

V_2= BARI brinjal 7 (Singnath)

T_1= 50% recommended urea + 750 ml NEB ha^{-1}

T_2= 50% recommended urea + 1000 ml NEB ha^{-1}

T_3= 50% recommended urea + 1250 ml NEB ha^{-1}

T_4= 50% recommended urea + 1500 ml NEB ha^{-1}

T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}

T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}

T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1}

T_8=100% recommended fertilizer

4.2.8 Root dry weight

Non-significant variation was found due to variety on root dry weight (Appendix XIII). Variety V_1 (ACI variety) showed the highest root dry weight (0.31 g) and the lowest root dry weight (0.28 g) was observed in the V_2 (Singnath) variety (Table 21).

Root dry weight was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XIII). The highest root dry weight (0.41 g) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) whereas the lowest root dry weight (0.21 g) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment (Table 22).

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on root dry weight (Appendix XIII). The highest root dry weight (0.43 g) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}). The lowest root dry weight (0.20 g) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}) (Table 23).

4.2.9 Shoot root dry weight ratio

Shoot root dry weight ratio found non-significant variation due to variety (Appendix XIII). The highest shoot root dry weight ratio (0.34) was found variety V_1 (ACI variety) and the lowest shoot root dry weight ratio (0.34) was observed in the V_2 (Singnath) variety (Table 21).

Shoot root dry weight ratio was found significantly varied against different doses of NEB and inorganic fertilizers (Appendix XIII). The highest shoot dry weight root ratio (0.36) was found from T_1 (50% recommended urea + 750 ml NEB ha^{-1}) treatment whereas the lowest shoot root dry weight ratio (0.32 cm) was found from T_5 (50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) (Table 22).

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted non-significant effect on shoot root dry weight ratio (Appendix XIII and Table 23).

CHAPTER V
SUMMARY AND CONCLUSION

The study was conducted in the research field of Sher-e-Bangla Agricultural University (SAU), Dhaka-1207, during February, 2016 to May, 2016 to evaluate the influence of NEB and fertilizer on growth, yield and seed quality of brinjal. ACI variety (Happy) and BARI brinjal 7 (Singnath) were used as planting material under present study. The experiment consisted of eight different combinations of NEB with inorganic fertilizers namely, T_1= 50% recommended urea + 750 ml NEB ha^{-1}, T_2= 50% recommended urea + 1000 ml NEB ha^{-1}, T_3= 50% recommended urea + 1250 ml NEB ha^{-1}, T_4= 50% recommended urea + 1500 ml NEB ha^{-1}, T_5= 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}, T_6= 50% recommended urea and 25% reduction of P, K, S + 1250 ml NEB ha^{-1}, T_7=50% recommended urea and 25% reduction of P, K, S + 1500 ml NEB ha^{-1} and T_8= 100% fertilizer. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The total numbers of unit plots were 48. The size of unit plot was 2.5 m × 3.0 m. The spacing 75 cm × 60 cm was used under present study. Data on different growth, yield and quality attributes were taken such as, yield attributes and yield *viz.* plant height, number of leaves $plant^{-1}$, number of branches $plant^{-1}$, stem diameter, days to first flowering, number of fruits $plant^{-1}$, fruit length, fruit breadth ratio, fruit length breadth ratio, weight of total fruits, yield t ha^{-1} and seed characteristics *viz.* 1000-seeds weight, germination percentage, seed vigor index, shoot length, root length, shoot root ratio, shoot dry weight, root dry weight and shoot root dry weight ratio.

Variety had significant effect on yield attributes and yield *viz.* plant height, number of leaves $plant^{-1}$, number of branches $plant^{-1}$, days to first flowering, number of fruits $plant^{-1}$, fruit length, fruit breadth, weight of total fruits, yield t ha^{-1} and non-significant on stem diameter, fruit length breadth ratio. Seed characteristics *viz.* 1000-seeds weight, germination percentage, seed vigor index, shoot length, root length had significant effect of variety and non-significant effect on shoot root ratio, shoot dry weight, root dry weight, shoot root dry weight ratio.

Different doses of NEB and inorganic fertilizers exerted significant effect on yield attributes and yield *viz.* plant height, number of leaves plant^{-1}, number of branches plant^{-1}, stem diameter, days to first flowering, number of fruits plant^{-1}, fruit length, fruit breadth, weight of total fruits and yield t ha^{-1} except fruit length breadth ratio. Different doses of NEB and inorganic fertilizers also showed significant effect on Seed characteristics *viz*. 1000-seeds weight, germination percentage, seed vigor index, shoot length, root length, shoot dry weight, root dry weight, except shoot root ratio, shoot root dry weight ratio.

Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on yield attributes and yield *viz.* plant height, number of leaves plant^{-1}, number of branches plant^{-1}, stem diameter, days to first flowering, number of fruits plant^{-1}, fruit length, fruit breadth, weight of total fruits, yield (t ha$^{-1)}$ except fruit length breadth ratio. Interaction effect between variety and different doses of NEB and inorganic fertilizers exerted significant effect on seed characteristics *viz.* 1000-seeds weight, germination percentage, seed vigor index, shoot length, root length, root dry weight except shoot root length ratio, shoot dry weight, shoot root dry weight ratio.

The highest plant height (56.55, 83.88 and 92.18 cm at 50, 70 and 90 DAT, respectively) was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}) and the lowest plant height (37.39, 55.46 and 60.94 cm at 50, 70 and 90 DAT, respectively) was observed $V_2 \times T_1$ (Singnath variety with 50% recommended urea + 750 ml NEB ha^{-1}). The highest number of leaves plant^{-1} (46.67, 102.59 and 115.27 cm at 50, 70 and 90 DAT, respectively) was observed in $V_1 \times T_5$ and the lowest number of leaves plant^{-1} (23.61, 51.91 and 58.32 at 50, 70 and 90 DAT, respectively) was observed in $V_2 \times T_1$. The highest number of branches plant^{-1} (11.67, 19.94 and 22.28 cm at 50, 70 and 90 DAT, respectively) was observed in $V_1 \times T_5$ and the lowest number of branches plant^{-1} (5.33, 9.12 and 10.19 cm at 50, 70 and 90 DAT, respectively) was observed in $V_2 \times T_1$. The highest stem diameter (1.63, 2.14 and 2.29 cm at 50, 70 and 90 DAT, respectively) was observed in $V_1 \times T_5$ and the lowest stem diameter (1.03, 1.35 and 1.47 cm at 50, 70 and 90 DAT, respectively) was observed $V_2 \times T_1$.

The longest duration to first flowering (50.33 days) was observed in $V_2 \times T_1$ and the shortest duration to first flowering of plant (37.00 days) was observed $V_1 \times T_5$. The highest number of fruits plant^{-1} (17.26) was observed in $V_1 \times T_5$ and the lowest number of fruits plant^{-1} of plant (10.40) was observed $V_2 \times T_1$. The highest fruit length breadth ratio (2.03) was observed in $V_1 \times T_5$ and the lowest fruit length breadth ratio (1.81) was observed $V_2 \times T_8$. The highest average fruit weight (100.72 g) was observed in $V_1 \times T_5$ and the lowest average fruit weight of plant (64.22 g) was observed $V_2 \times T_1$. The highest yield (34.76 t ha^{-1}) was observed in $V_1 \times T_5$ and the lowest yield (14.36 t ha^{-1}) of plant was observed $V_2 \times T_1$.

The highest 1000-seeds weight (7.08 g) was observed in $V_1 \times T_5$ and the lowest 1000-seeds weight (4.69 g) was observed $V_2 \times T_1$. The highest germination percentage of brinjal seed (85.33 %) was observed in $V_1 \times T_5$ and the lowest germination percentage of brinjal seed (65.67 %) was observed $V_2 \times T_1$. The highest seed vigor index (1546.66) was observed in $V_1 \times T_5$ and the lowest seed vigor index (970.00) was observed $V_2 \times T_1$.

The highest shoot length (4.14 cm), root length (6.41 cm), was observed in $V_1 \times T_5$ (ACI variety with 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB ha^{-1}). The lowest shoot length (2.14 cm) and root length (2.97 cm) was observed $V_2 \times T_1$. The highest shoot dry weight (0.14 g) and root dry weight (0.43 g) was observed in $V_1 \times T_5$ and the lowest shoot dry weight (0.07 g) and root dry weight (0.22 cm) was observed $V_2 \times T_1$.

Conclusion

On the basis of present study it may be concluded that, the application of NEB as NRE has the capacity to improve the performances of brinjal. With considering the yield attributes and yield of brinjal and brinjal seed the application of 50% recommended urea and 25% reduction of P, K, S + 1000 ml NEB per hectare exhibited significantly the best one in case of higher plant height, number of leaves plant^{-1}, number of branches plant^{-1}, number of fruits per plant, fruit length breadth ratio, weight of fruits, yield, 1000-seeds weight, germination percentage and seed vigor index. The NEB also showed better and positive response of growth traits of brinjal plant compared to 100% application of inorganic fertilizers in the field.

Recommendations

1. Usually the brinjal growers use recommended rate of fertilizers on their crop field so, the exogenous application of root exudates might be improved the quality of brinjal as found from present study.

3. If, brinjal growers apply root exudates on their field it may reduce the rate of fertilizer especially nitrogenous (urea) per hectare and may reduce the cost of production per hectare by reducing the bulkiness of fertilizer carrying and maintenance cost too.

4. So, it may be recommended that the application of 100 % inorganic fertilizers is replaceable by NEB as NRE for betterment of brinjal in combination with reduced inorganic fertilizers.

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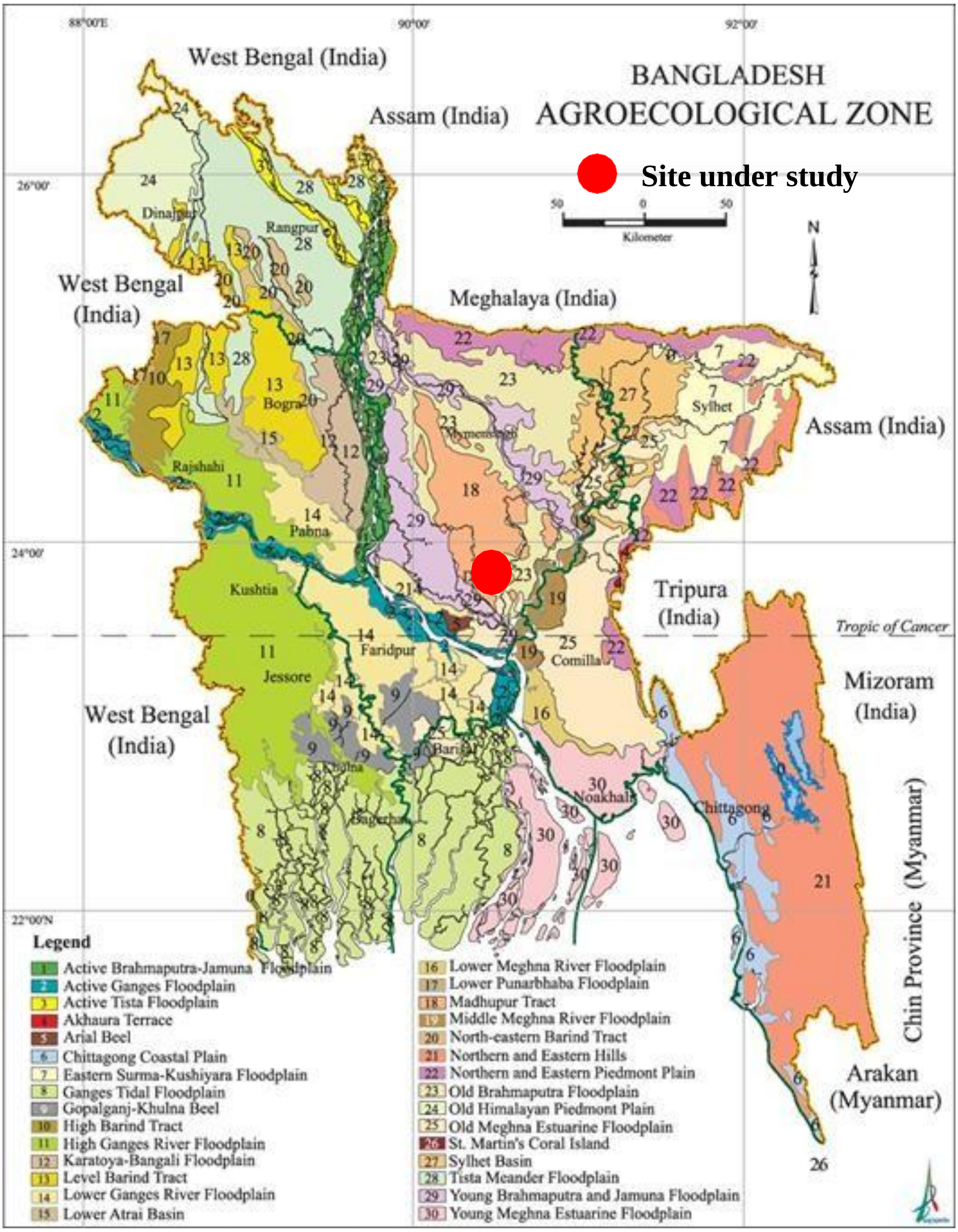
APPENDICES

Appendix I. Map Showing the site used for present study



Appendix II. Soil characteristics of experimental farm of Sher-e-Bangla Agricultural University are analyzed by soil Resources Development Institute (SRDI), Farmgate, Dhaka

A. Morphological characteristics of the experimental field

Morphological features	**Characteristics**
Location	Farm, SAU, Dhaka
AEZ	Modhupur tract (28)
General soil type	Shallow red brown terrace soil
Land type	High land
Soil series	Tejgaon
Topography	Fairly leveled
Flood level	Above flood level
Drainage	Well drained
Cropping pattern	**N/A**

B. Physical and chemical properties of the initial soil

B. Physical and chemical properties of the initial soil Characteristics	**Value**
Practical size analysis	
Sand (%)	16
Silt (%)	56
Clay (%)	28
Silt + Clay (%)	84
Textural class	Silty clay loam
pH	5.56
Organic matter (%)	1.00
Total N (%)	0.06
Available P (µgm/gm soil)	42.64
Available K (me/100g soil)	0.13

Source: SRDI

Appendix III. Monthly average temperature, relative humidity and total rainfall of the experimental site during the period from February, 2016 to May, 2016

Month	Air temperature (^{0}C)		R. H. (%)	Total rainfall (mm)
	Maximum	Minimum		
February,2016	25.12	13.89	76	3
March, 2016	28.40	15.60	67	11
April, 2016	30.85	16.96	65	63
May, 2016	34.42	21.46	68	39

Source: Bangladesh Metrological Department (Climate and weather division) Agargaon, Dhaka

25 m

12 m

V_1T_1	V_1T_2	V_1T_3	V_1T_4	V_1T_5	V_1T_6	V_1T_7	V_1T_8	R_1
V_2T_1	V_2T_2	V_2T_3	V_2T_4	V_2T_5	V_2T_6	V_2T_7	V_2T_8	
V_1T_1	V_1T_2	V_1T_3	V_1T_4	V_1T_5	V_1T_6	V_1T_7	V_1T_8	R_2
V_2T_1	V_2T_2	V_2T_3	V_2T_4	V_2T_5	V_2T_6	V_2T_7	V_2T_8	
V_1T_1	V_1T_2	V_1T_3	V_1T_4	V_1T_5	V_1T_6	V_1T_7	V_1T_8	R_3
V_2T_1	V_2T_2	V_2T_3	V_2T_4	V_2T_5	V_2T_6	V_2T_7	V_2T_8	

Appendix IV. A Field lay out of the experimental plot

Legend:

1. Width of the plot = 2.5 m
2. length of the plot = 3.0 m
3. Space around the land = 0.75 m
4. Space between the block =0.50 m
5. Space between the plot =0.30 m

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Appendix V. Mean square values plant height at different DAT

Source of variation	df	Plant height		
		50 DAT	70 DAT	90 DAT
Replication	2	56.562	68.414	33.403
Variety (A)	1	992.993**	2184.436**	2638.405**
Treatment (B)	7	64.214**	141.284**	170.606**
AB	7	61.315**	96.914**	96.664**
Error	30	4.686	7.693	5.610

**= Significant at 1% level of Probability

Appendix VI. Mean square values for number of leaves plant^{-1} at different DAT

Interaction	df	Number of leaves plant^{-1} at		
		50 DAT	70 DAT	90 DAT
Replication	2	11.171	54.082	68.224
Variety (A)	1	778.516**	3762.490**	4749.335**
Treatment (B)	7	173.827**	840.052**	1060.613**
AB	7	41.260**	154.428**	168.692**
Error	30	6.018	9.069	6.714

**= Significant at 1% level of Probability

Appendix VII. Mean sum square values for number of branches plant^{-1}at different DAT

Source of variation	df	Number of branches plant^{-1}		
		50 DAT	70 DAT	90 DAT
Replication	2	0.263	0.768	0.960
Variety (A)	1	108.300**	315.905**	395.142**
Treatment (B)	7	10.750**	31.381**	39.220**
AB	7	18.167**	53.394**	64.258**
Error	30	0.514	1.377	2.968

**= Significant at 1% level of Probability

Appendix VIII. Mean sum square values for stem diameter at different DAT

Source of variation	df	Stem diameter		
		50 DAT	70 DAT	90 DAT
Replication	2	0.054	0.091	0.110
Variety (A)	1	0.025NS	0.043NS	0.051
Treatment (B)	7	0.099*	0.167**	0.198*
AB	7	0.069*	0.151**	0.181*
Error	30	0.014	0.030	0.048

NS= Not Significant, *= Significant at 5% level of Probability, **= Significant at 1% level of Probability

Appendix IX. Mean sum square values for Days to first flowering, fruit length, fruit breadth and length breadth ratio

Source of variation	df	Days to first flowering	Fruit length	Fruit breadth	Length breadth ratio
Replication	2	3.646	2.321	0.227	0.002
Variety (A)	1	77.521**	64.821**	9.275**	0.025NS
Treatment (B)	7	110.259**	77.073**	13.427**	0.017NS
AB	7	45.283**	0.125**	7.011**	0.000NS
Error	30	2.779	0.524	0.107	0.004

NS= Not Significant, **= Significant at 1% level of Probability

Appendix X. Mean sum square values for Number of fruits plant^{-1}, Average fruit weight, Yield

Source of variation	df	Number of fruits plant^{-1}	Average fruit weight	Yield
Replication	2	0.267	5.380	2.307
Variety (A)	1	43.873**	2000.534**	535.202**
Treatment (B)	7	19.510**	413.893**	163.517**
AB	7	35.264**	44.827**	5.246**
Error	30	0.282	1.482	1.102

**= Significant at 1% level of Probability

Appendix XI. Mean sum square values for 1000-seeds weight, germination percentage, and seed vigor index

Source of variation	df	1000-seeds weight	Germination percentage	Seed vigor index
Replication	2	0.002	1.083	3291.411
Variety (A)	1	5.267**	588.000**	77240.630**
Treatment (B)	7	3.600**	123.190**	195722.118**
AB	7	2.012**	24.034**	5214.321**
Error	30	0.047	0.372	1466.911

**= Significant at 1% level of Probability

Appendix XII. Mean sum square values for shoot length, root length and shoot root length ratio

Source of variation	df	Shoot length	Root length	Shoot root length ratio
Replication	2	0.003	0.008	0.000
Variety (A)	1	0.921*	3.137**	0.000NS
Treatment (B)	7	2.020**	5.452**	0.004NS
AB	7	0.004*	1.018**	0.000NS
Error	30	0.005	0.011	0.0002

NS= Not Significant, *= Significant at 5% level of Probability, **= Significant at 1% level of Probability

Appendix XIII. Mean sum square values for shoot dry weight, root dry weight and root shoot dry weight ratio

Source of variation	df	Shoot dry weight	Root dry weight	Root shoot dry weight ratio
Replication	2	0.000	0.000	0.000
Variety (A)	1	0.002*	0.014 NS	0.000 NS
Treatment (B)	7	0.002**	0.024**	0.001**
AB	7	0.000 NS	0.00001*	0.000 NS
Error	30	0.000	0.0002	0.0001

NS= Not Significant, *= Significant at 5% level of Probability, **= Significant at 1% level of Probability

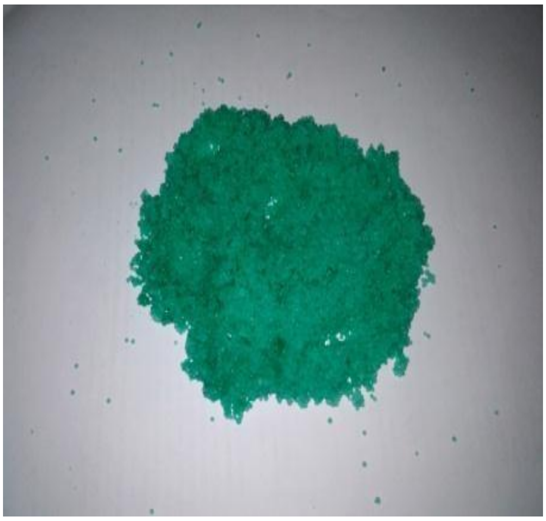

Plate 1: Compound of NEB fertilizer

Plate 2: Fertilizer weighting scenario

Plate 3: Transplanting of brinjal plant in experimental plot

Plate 4: Data collection from experimental plot

Plate 5: Field survey

Plate 6: Harvesting brinjal from three plant of a treatment

Plate 7: Extracted seed from different combination

Plate 8: Placement of 100-seeds for germination