THE ROLE OF PRUNING METHODS ON GROWTH, YIELD AND PROFITABILITY OF BRINJAL UNDER THREE VARIETIES

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DECEMBER, 2020

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REGISTRATION NO: 18-09108

A Thesis
Submitted to the Faculty of Agriculture
Sher-e-Bangla Agricultural University, Dhaka
In partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE (MS)

IN

HORTICULTURE

SEMESTER: JULY- DECEMBER, 2020

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CERTIFICATE

This is to certify that the thesis entitled **"THE ROLE OF PRUNING METHODS ON GROWTH, YIELD AND PROFITABILITY OF BRINJAL UNDER THREE VARIETIES"** submitted to the Department of Horticulture, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (M.S.)** in **HORTICULTURE**, embodies the result of a piece of bonafide research work carried out by **AMINA KHANOM**, Registration No. **18-09108** 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.

December, 2020
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Dedicated
to
My Heartfelt Parents

ACKNOWLEDGEMENTS

The author considers it a great honor to offer her heartfelt gratitude to Allah, the Almighty, for her never-ending blessings on the successful conclusion of the research work.

The author wishes to express her gratitude and best wishes to her respected Supervisor, ***Dr. Tahmina Mostarin, Professor****, Department of Horticulture, Sher-e-Bangla Agricultural University, Dhaka, for her constant guidance, helpful criticism, encouragement, and helpful suggestions during the research and preparation of this thesis.*

The author wishes to express her heartfelt gratitude, sincere appreciation, and immense indebtedness to her reverend Co-supervisor, ***Dr. Khaleda khatun, Professor****,Department of Horticulture, Sher-e-Bangla Agricultural University, Dhaka, for her scholarly supervision, helpful commentary, and unwavering inspiration throughout the research work and thesis preparation.*

The author wishes to express her heartfelt gratitude to the honorable Chairman, ***Dr. Md. Jahedur Rahman****, Department of Horticulture, as well as all other respected teachers and staff members of the Department of Horticulture, Sher-e-Bangla Agricultural University, Dhaka, for their support during the study period.*

The author is proud to express her heartfelt and unending gratitude to all of her course mates and friends for cooperating and assisting her during data collection from the field and thesis preparation. The author wishes to express her heartfelt gratitude to her lab mates, classmates, and friends for their eager assistance, co-operation, and encouragement.

The author would like to express her heartfelt gratitude to her beloved parents, Elder Sister and Brother, and all other family members for their prayers, encouragement, constant inspiration, and moral support for his higher education. May the Almighty bless and keep them all safe.

December, 2020 ***The Author***

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ABSTRACT

The experiment was conducted in the Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh to evaluate the role of pruning methods on growth, yield and profitability of brinjal under three varieties. The experiment consisted of two factors. Factor A: Methods of pruning as P_0= Control, P_1= Old leaf remove, P_2= Lateral branch pruning, P_3= Old leaf remove and lateral branch pruning and Factor B: 3 varieties of brinjal as V_1= BARI Begun-4, V_2= BARI Begun-7, V_3= BARI Begun-10. The experiment was laid out in a Randomized Complete Block Design with three replications. In case of pruning, the highest number of flower (38.87), the maximum number of fruit per plant(27.83) and the highest yield (49.73 t/ha) were recorded from P_3 treatment, while the minimum were from P_0 treatment. In case of variety, the maximum number of flower (41.23), the highest number of fruit harvested per plant (29.23) and the highest yield (52.83 t/ha) were found from V_1 treatment whereas the lowest from V_2 treatment. Due to combined effect, the maximum number of flower (49.20), the maximum number of fruit harvested per plant (33.64), the highest yield (55.70 t/ha) were recorded from P_3V_1. So, it can be concluded that 'BARI Begun-4' with old leaf remove and lateral branch pruning gave the maximum yield. The highest gross return (10,02,600 tk/ha), highest netreturn (6,79,649 tk/ha) and highest benefit cost ratio (3.1) were obtained from P_3V_1 (old leaf remove and lateral branch pruning) treatment combination. So, the economic analysis revealed that the P_3V_1 treatment combination appeared to be the best for achieving the higher growth, yield and economic benefit of brinjal.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATED TERMS

ABBREVIATION	FULL NAME
Agril	Agricultural
AVRDC	Asian Vegetable Research and Development centre
AEZ	Agro-Ecological Zone
BBS	Bangladesh Bureau of Statistics
BARI	Bangladesh Agricultural Research Institute
cv.	Cultivar (s)
cm	Centimeter
CV %	Percent Coefficient of Variation
DAT	Days After Transplanting
DMRT	Duncan's Multiple Range Test
df	Degrees of Freedom
et al.,	And others
RCBD.	Randomized Complete Block Design
etc.	Etcetera
LSD	Least Significant Difference
MoP	Muriate of Potash
°C	Degree Celsius
TSP	Triple Super phosphate
Kg	Kilogram (s)
LSD	Least Significant Difference
m^2	Meter squares
R.H	Relative humidity
SAU	Sher-e-Bangla Agricultural University
^oC	Degree Celceous
%	Percentage

CHAPTER I

INTRODUCTION

Brinjal (*Solanum melongena* L.) belongs to the family solanaceae. It is also recognized as aubergine or brinjal or guinea squash or garden egg. South East Asia is considered the origin of brinjal (Lester and Hasan, 1991). It is one of the most common, popular and principle vegetable crops. Among different crops, brinjal is a vital vegetable crop of Bangladesh. The fruits are low in calories and contain a mineral composition which is beneficial for human health. Its nutritive value varies among varieties. It contains vitamin A and B. Per 100g of edible portion of brinjal contains water (93 g), protein (1.2 g), Vit.-A (70 IU), thiamin (0.05 mg), fat (0.1 g), riboflavin (0.08 g), carbohydrate (4.0g), niacin (0.09mg), fibre (1.2g), calories-(20) (Bose and Some, 1986). It is also enriched with calcium (6mg/100g) and iron (0.9mg/100g) (Zenia and Halim, 2008). It is also supposed to contain certain medicinal properties. It is indicated for the treatment of several diseases like diabetes, arthritis, asthma and bronchitis. It regulates blood sugar levels and also helps to control glucose absorption. It is recommended for the remedy of liver problems (Shukla and Naik, 1993). In addition, several groups have provided evidence that in reducing blood and liver cholesterol rates in human body, eggplant extracts have a significant effect (Khan, 1979). It is said to be beneficial for diabetic patients (Choudhury, 1976). It is the 2nd most valuable vegetable crop next to potato in Bangladesh in respect of acreage and production (BBS, 2017). It is cultivated round the year both as rabi and kharif crops (Rashid, 1993). In Bangladesh, it is cultivated in almost all districts. As a result, small, marginal and landless farmers get a continuous source of income and employment facilities. The total area of brinjal cultivation is 45,665 acres in kharif season (summer) with a total annual production of 1,59,891 MT whereas 48,725 acres is grown in rabi season (winter) with a total annual production of 22,77,500 MT in Bangladesh (BBS, 2017). But, its production is lower than other countries like India, China, Egypt etc. The reasons behind such low yield are lack of high yielding varieties, poor crop management, soil type and improved technologies. A large number of brinjal varieties are grown which are of exotic origin and were developed long before. Most of them do not perform the same as before. Hence, in order to improve the present situation

of brinjal production, it is essential to promote better varieties and techniques to the growers of the country. Bangladesh Agricultural Research Institute has developed some high yielding varieties with good yield contributing characters. Some high yielding varieties in our country are BARI Begun-2 (Tarapuri), BARI Begun-4 (Kazla), BARI Begun-5 (Nayantara), BARI Begun-6 (Ishurdi), BARI Begun-7 (Singnath), BARI Begun-9 (Dohazari), BARI Begun-10 (Bholanath). Also, there are several local varieties of brinjal grown in our country such as Tanpuri, Khotkhotia, Islampuri etc. All varieties do not perform the same. Some varieties give higher yield while some varieties give lower.

Pruning is done with the objectives of increasing yield by encouraging new shoots (Singh, 1985). It improves penetration of light inside the plant canopy. Plant's photosynthesis efficiency and fruit yield increases by pruning (Rajewar & Patil, 1979 and Ambroszczyk *et al*., 2008). Vegetative growth, as a powerful sink, consumes produced assimilates. Reduction of vegetative growth enhances assimilate transport to roots or fruits. So, fruit quantity and quality may be improved through proper balance between vegetative and reproductive growth (Arzani *et al*., 2009). Eggplants have suckers or lateral branches like other members of nightshade family. These branches should be pruned to give more nutrients to the main plant. Brinjal and tomato belong to the same family. As tomato plants can be severely pruned without affecting the yield (Patil *et al*., 1973), pruning may also be practiced in brinjal plants. Old leaves make the plants bushier and attracts pests which make the plants prone to diseases. Moreover, proper air circulation gets hampered. By removing these leaves may improve plant health and proper air circulation. So, appropriate pruning procedures may aid in enhancing vegetative development and production of brinjal in our country. By the proper management of these cultural practices, it may be possible to increase the yield of brinjal. Therefore, an experiment was conducted to determine the impact of different pruning methods on growth and yield of brinjal under three varieties.

Considering above facts, the present experiment was undertaken-

- To know the effect of different pruning methods on growth and yield of brinjal.
- To investigate the performance of varieties on growth and yield of brinjal.
- To identify the combined effect of different pruning methods and varieties on growth and yield of brinjal.

CHAPTER II

REVIEW OF LITERATURE

Brinjal is known as one of the most significant and extensively used vegetables in our country and worldwide. However, its production is low compared to other region of the world. It is low due to lack of high yielding varieties, soil properties, proper management practices. Selecting variety, branch pruning and leaf removing may play a vital role in increasing yield of brinjal. However, some of the important and informative works and research findings related to pruning and leaf removing so far been done at home and abroad on this crop have been reviewed in this chapter-

Islam (2016) carried out an experiment at Plant Physiology laboratory of Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh, Bangladesh to study the effect of defoliations on crop characters, yield attributes and two tomato varieties yield. It comprised five defoliation levels viz., 0 (control), 3, 6, 9 and 12 leaves defoliation out of 16 leaves and Binatomato-4 and Binatomato-5 varieties. Results revealed that there was no significant effect of defoliation and variety on the studied crop characters and yield, but they had effect on the number of effective flower clusters per plant and fruit yield for variety. Through defoliations over control up to 6 leaves, parameters like plant height, branch number and leaves per plant, straw weight per plant, number of effective and non effective flower cluster per plant, number of flowers and fruits per plant, individual fruit weight and fruit yield per plant improved and in 3 leaves defoliated plants, these results were highest. On the other hand, the lowest was obtained in 12 leaves defoliated plants followed by 9 leaves defoliated plants. Therefore, they found out that fruits number per plant and fruits number per cluster were higher in Binatomato-5 whereas fruit yield was lower in Binatomato-4 with smaller fruit size.

Goda, Y. *et al.* (2014) carried out an experiment to study the response of husk tomato to some pruning treatments on growth, yield and fruit quality. They trained Plants on thread and pruned the plants as follows: Control as plants were left to grow without pruning, plants were pruned to three shoots on the main stem, plants were pruned to six shoots on the main stem and plants were pruned to nine shoots on the main stem. They found that

all pruning treatments improved vegetative growth. It was also revealed that the pruning treatments had a positive effect in average fruit weight, size and diameter, but the fruit firmness decreased compared with the control.

Alsadon *et al.* (2013) carried out an experiment to find the effect of pruning systems on vegetative growth, yield and quality traits of three hybrid bell pepper cultivars: 'Pasodoble', 'Lirica' and 'Sondela'. Under greenhouse conditions, cultivars were grown in drip fertigated soil culture and pruning was practiced keeping one main branch, two and four side branches. They found that vegetative growth, yield and quality traits of plants were affected by pruning systems and their interactions. The highest early and total yield was obtained from 'Pasodoble' F_1 yellow cultivar because of the relative rapid fruit set and fruit number. 'Lirica' F_1 yellow cultivar had large fruit size which was heavier, longer, wider and had thicker pericarp. Whereas, 'Sondela' F_1 red cultivar produced superior fruit quality containing vitamin C, titratable acidity, total soluble solids and total sugars. Pepper plants which were pruned to one branch showed a significant increase in early yield, fruit size and internal fruit quality but total fruit yield decreased followed by plants pruned to two branches. However, the highest yield was found from plants pruned to four branches due to higher number of fruits plant^{-1}. 'Pasodoble' F_1 plants pruned to 4 branches gave the highest fruit number and total yield. Whereas, pruning 'Lirica' F_1 plants to one branch increased fruit weight, fruit size. It also produced thicker flesh width. Besides, fruit quality characters; 'Sondela' F_1 red pepper represented a vital source of vitamin C especially under one branch pruning system.

Hesamil *et al.* (2012) carried out an experiment to determine the effect of shoot pruning and flower thinning on quality and quantity of fruits of semi-determinate tomato in a greenhouse of the Faculty of Agriculture and Natural Resources, Persian Gulf University of Bushehr. They found that pruned plants produced higher leaf area and plants yield than control. Yield was significantly higher from pyramidal pruning and cluster thinning with remaining 5 flowers than other treatments. They identified that vitamin C in fruits increases in pyramidal pruning, but it had no significant effect on total soluble solids.

Maboko *et al.* (2011) carried out an experiment to determine the effect of plant population, flower and stem pruning of hydroponically grown peppers in a 40% (black

and white) shade net structure at the ARC-Roodeplaat VOPI. The treatments were like three plant populations (2, 2.5 and 3 plant/m^2), three stem pruning (2, 3 and 4 stems) and three flower pruning (removal of first two or first four flowers or zero flower removal). Stem pruning to four stems without removing any flowers at a plant population of 3 plants/m^2 produced the highest yield and quality. First two or four fruits pruning had no significant effect on yield. They observed that yield and quality can be effectively influenced by plant population and stem pruning. On the otherhand, there was insignificant effect of flower pruning.

Maboko *et al.* (2009) conducted an experiment to determine the response of hydroponically grown tomatoes (*Lycopersicon esculentum*) to stem and fruit pruning was observed in a shade net structure. Pruning was practiced keeping either one or two stems with three fruit pruning treatments (six or four fruits per truss with no fruit removal). Pruned plants with two stems resulted in a significant increase in total and marketable yield, but unmarketable yield was decreased. Zero fruit pruning increased the total number and mass of small fruits, although the fruit pruning treatments had no significant effect on marketable yield. Plants which are pruned to two stems produced a higher number of fruits per plant, while the competition for assimilates lead to smaller fruit size. The increased incidence of cracking with the single stem pruning can be related to the larger fruit size obtained with this treatment. The study showed that yield and fruit size can be effectively influenced by stem pruning, while fruit pruning has only a limited outcome.

In Poland, Ambroszczyk *et al.* (2008) conducted an experiment to determine the relations between pruning methods and chosen parameters of vegetative eggplant development in greenhouse conditions. The plant shape alters the photosynthetically active radiation (PAR) conditions in the plant profile. Independence between different pruning methods and vegetative plant development particularly leaves traits as well as pigments and photosynthesis products content in leaves was showed. In the early spring-summer production, eggplant of Tania F1 hybrid was used in a heated greenhouse. The pruning systems were: pruning to one shoot with leaving on every node 2 fruit sets and 1, 2 or 3 leaves, and pruning to two shoots with leaving on every node 1 fruit set and 1, 2 or 3

leaves. Shoots irradiation reduced with the introduction of a greater number of leaves and fruit sets on eggplant in plant profile. The way of pruning depended on the value of leaf area index (LAI). Leaf's Chemical composition was to some extent dependent on the method of pruning only in the case of assimilation products, i.e. reducing sugar and starch. Development of photosynthesis efficiency of intensively pruned eggplants was achieved by the increase of single leaf area and thickness of leaf mesophyll tissues devoid of the increase of the level of assimilative pigments per plant mass unit.

An experiment was conducted by Maboko *et al.* (2008) to find out the effect of pruning on yield and quality of two cherry tomato cultivars (Naomi and Josefina) with an indeterminate growth habit investigated in an open bag hydroponic system at ARC-VOPI. There were three pruning treatments (one, two and three stems) in a complete randomized block design (RCBD) with three replications. Fruit harvesting was done at the full ripe stage, and the fruit number, size and mass, marketable yield and total yield as well as the total soluble solids were determined for all treatments. They showed that fruit size increasing was apparent in plants pruned to a single stem compared to plants pruned to two or three stems in both cultivars. With an increase in the number of stems, the yield of plants increased. Cultivar Josefina had a significantly higher marketable yield compared to cultivar Naomi. Despite cultivar, pruning to two or three stems was effective in increasing yield and reducing fruit size to a size which is currently more suitable to the market.

Muhammad *et al.* (2007) carried out experiments during 2004/05 and 2005/06 dry season under irrigation at the Usmanu Danfodiyo University, Fadama Teaching and Research Farm, Sokoto in order to determine the effects of intra-row spacing and pruning on Roma VFN cultivar of tomato. The treatments comprised of factorial combination of two training (Staked and unstaked), three intra-row spacings (20, 40 and 60 cm) and three pruning levels (three-stem, two-stem and unpruned) which were laid out in a split-plot design replicated three times. while spacing and pruning were allocated to the sub plots, training was allocated to the main plots. They reported that mean fruit length and diameter was significantly higher in 60 cm spaced plants than 20 and 40 cm and two to three stem pruned plants produced higher fruit length and diameter. Highest total fresh

fruit yield was obtained at closer (20-40 cm) intra-row spacing. They reported that number of marketable fruits per plant was reduced by pruning, but the weight of marketable fruits per plant was increased. Mean fruit weight was higher for 40 and 60 cm inter-row spacing and three-stem pruning whereas total fresh fruit yield was higher in 20-40 cm intra-row spacing and three stem pruning. Moreover, they found that for maximum fresh tomato yield and quality, an intra-row spacing of 20-40 cm was suitable.

Muhammad (2007) carried out Replicated field trials at the Usmanu Danfodiyo University Fadama Teaching and Research Farm, Sokoto, during 2004/05 and 2005/06 dry seasons to determine the effects of training and pruning on growth and yield of tomato (*Lycopersicon lycopersicum* Mill.) variety Roma VFN. Treatments comprised of factorial combination of two levels of training (staked and unstaked) and three levels of pruning (three-stem, two-stem and unpruned) and three levels of intra- row spacing (20, 40 and 60 cm) laid out in a split-plot design replicated three times with training allocated to the main plots and pruning intra-row spacing to the sub- plots. They reported that mean fruit length and diameter in the first trial, fruit weight in both trials and the two trials combined, total fresh fruit yield in the first trial and combined and percentage marketable yield in the first trial and the combined were significantly higher in the tomato plants which were staked. The mean fruit length, diameter and weight in both trials were significantly higher in three-stem and two- stem pruned plants than unpruned plants. Similarly, the highest total fresh fruit yield in both trials was produced in three-stem pruned plant. Significant training and pruning interactions recording showed that the highest percentage of marketable yield was at staked and pruned (both three and two-stem) plants; while two-stem with staking or no staking produced the highest mean fruit weight.

Ara *et al.* (2007) carried out an experiment to examine the effect of spacing (40 and 50 cm) and stem pruning (one stem, two stem, three stem and no pruning) on the yield of indeterminate type BARI Tomato-6 variety at Regional Agricultural Research Station, Ishurdi, Pabna during 2005-2006. They showed that wider spacing (50 cm) gave the higher marketable yield (82.39 tha^{-1}) and closer spacing gave the lowest marketable yield (68.32 tha^{-1}) and number of fruits/plant. Two stem pruning yielded the highest marketable

yield (87.18 tha^{-1}) and one stem pruning gave the lowest number of fruits/plant. But, stem pruning also yielded the lowest marketable weight of fruits/plant. Wider spacing coupled with two stem pruning showed superior interaction (97.08 tha^{-1}) to others.

In Poland, Ambroszczyk *et al.* (2007) accomplished an experiment with the aim of the investigations to determine the method of eggplant (aubergine) pruning, optimizing the proportions between vegetative and generative plant development. The experiment was carried out in 1999-2001 in the experimental greenhouse of Agricultural University in Krakow, Poland. 'Tania F_1 ', cultivar was used in the early spring- summer production in a heated greenhouse. The following treatments were applied: pruning to one shoot with leaving on every node 2 fruit sets and 1, 2 or 3 leaves, and pruning to two shoots with leaving on every node 1 fruit set and 1, 2 or 3 leaves. Plants pruned to two shoots received meanly 22% less of PAR in comparison to plants pruned to one shoot. Among the treatments, the most beneficial light conditions were observed in treatments pruned to one shoot with two fruit sets per node. Pruning affected the effectiveness of fruit setting at a great extent, especially in treatments pruned to two shoots. Plants pruned to two shoots with one fruit set and three leaves per node set fruits the most evenly on subsequent nodes. The vegetative and generative eggplant development was balanced in the highest degree with this pruning system. But, intensive plant pruning did not reduce the eggplant yield in the present experiment. Also the systems of pruning did not affect earliness of production. Mean early yield from first four harvests was 4.06 kgm^{-2} (total) and 4.04 kgm^{-2} (marketable) without statistical differences among treatments. Also total (10.44 kgm^{-2}) and marketable (9.41 kgm^{-2}) yield was not affected by the pruning system. Plants pruned more intensively (one shoot, two fruit sets per node) produced more first grade fruits.

Leonardi *et al.* (2004) conducted an experiment to determine the effects on 'cherry' tomatoes of the more or less drastic reduction of the leaf surface area by the removal of basal leaves during two growing cycles marked by contrasting climatic conditions. The results showed that basal leaf removal of cherry tomato plants determines slightly negative effects on some qualitative characteristics of the fruit. However, they did not show significant effects on fructification timing or produce characteristics.

Andriolo *et al.* (2004) conducted an experiment to determine the effect of plant density combined with defoliation on growth and fruit yield of greenhouse tomato plants grown in soil. Treatments consisted of 3.3 (T_1), 6.7 (T_2) and 10.0 (T_3) plants m^{-2}. In T_1, three leaves per sympod were left. In T_2, for each two plants within a row, on the first plant one leaf was kept in the first sympod, whereas on the second plant two leaves were kept in the sympod of the same order. In the second sympod, two and one leaves were kept, inversely from the preceding one, and so on during the growth of the crop. In T_3, only one leaf per sympod was kept. The number of leaves and fruits was similar among treatments in autumn. In spring, it was higher on T_2 plants. Fruit yield was higher on T_2 plants in both experiments. For commercial production of this crop grown in soil under protected cultivation, the plant density and defoliation procedure tested in T_2 might be used to increase fruit yield.

Pessarakli and Dris (2003) performed an experiment to find out the effects of pruning and spacing, major cultural practices, on the yield and quality of eggplants. They observed that proper pruning and optimum spacing substantially increase eggplant yield and improve its fruit quality.

Andriolo *et al.* (2001) performed an experiment to examine the effect of defoliation on dry matter accumulation and distribution to fruits. Treatments consisted of plants bearing one, two, and three (control) leaves per sympod, by pruning leaves below each new truss, just after it appearance. Periodical destructive measurements were made to determine the number of leaves and fruits, and dry matter of shoot organs. The number of leaves per plant differed by a factor of about two and three, as a consequence of pruning leaves, affecting fruit set and, consequently, the number of fruits per plant. They found no constant ratio between number of leaves and fruits. Total dry matter was higher on plants with three leaves per sympod, but fruit dry matter did not differ significantly among treatments. It was concluded that the extra dry matter accumulated in non-defoliated plants was not allocated to fruits, remaining mainly in leaves. For commercial purposes, higher densities of leaf-pruned plants was suggested as a practice to simultaneously maximise light interception and fruit yield per unit soil surface.

Arin and Ankara (2001) carried out an experiment in unheated glasshouse. It was conducted to determine the effect of low-tunnel, mulch and pruning treatments on yield and earliness tomato cv. Fuji F1 tomato (*Lycopersicum esculentum* Mill. Plant height, stem diameter, days to first harvest, early yield (g/plant), total yield (g/plant) and fruit weight (g/fruit) were determined during the growing period. They found that there was a positive effect on plant growth development of low-tunnel, mulching and pruning. The highest early yield was obtained from the plants pruned from the 4th truss and mulched with any mulch under low-tunnel. Total yield was highest in plants pruned from 8th truss and mulched with wheat straw.

An experiment was carried out by Singh *et al.* (1999) to determine the effect of leaf pruning on growth and yield of brinjal in a cv. Pusa purple Long. Pruning of older leaves was very light (2-3), light (4-5), medium (6-7), heavy (8-9) and very heavy (10-11 leaves) with control (having no leaf pruning). Extreme pruning advanced flowering and fruiting by 10 days but total yield was declined. Light and medium leaf pruning generally induced flowering 6-7 days earlier and produced the highest yield (5.5 $kgplant^{-1}$). Generally, very light leaf pruning was not effective in manipulating flowering and fruiting.

Uddin *et al.* (1996) carried out an experiment in the field of kasetsart University, Kamaphaeng Saen campus, Thailand from October 1995 to February 1996 to investigate the effect of stem pruning (one stem, Two stem, three stem and no pruning) and plant spacing (40 & 50 cm) on the yield was evaluated on indeterminate type FI hybrid tomato variety FMTT22. Two stem pruning yielded the highest (56.20 tha^{-1}) with closer spacing (40 cm) and gave higher yield (55.34 tha^{-1}). Two stem pruning along with 40 cm plant spacing showed superior interaction.

Dhar *et al.* (1993) accomplished an experiment on pruning and number of plants hill-1 on tomato. They reported that the double branched plants produced the highest yield (96.25 tha^{-1}) followed by that in unpruned plants (66.21 tha^{-1}) and single branched (61.29 tha^{-1}) plants. In case of number of plants $hill^{-1}$, three plants $hill^{-1}$ produced the highest yield (75.51 tha^{-1}) followed by that from two plants (62.58 tha^{-1}). For fruit size, weight and yield of tomato, the interaction effect was found significant.

An experiment was carried out by Poksoy *et al.* (1993) to find out the effects of different pruning on the yield and quality of eggplant cultivars grown in green house conditions. Plants of the F, aubergine cultivars Dusky, Vittoria, Valentina, Indra, Sicilia, Palmira and Imperial were pruned to leave either 2 or 3 main shoots above 30- 35 cm height with lateral shoots pruned to leave a fruit and 3 leaves or left not pruned. Both pruning procedures (i.e. to 2 or 3 shoots) significantly rose main shoot length and fruit yield of good quality. Pruning method did not affect total yield. They found the highest total and good quality fruit yields with the cultivars Sicilia and Imperial.

The aim of the study of Decoteau (1990) was to determine the influence of leaf removal and decapitation (removal of apical bud and top two nodes) of determinate tomato (*Lycopersicon esculentum* Mill CV. Mountain Pride) plants on canopy development. Subsequent leaf development and distribution, and early fruiting of greenhouse-grown tomato plants were influenced by leaf remove and decapitation. By removing of young axillary leaves, the size of main (true) leaves in the middle and upper nodes, the number of nodes, and the number of early fruit produced were increased. Axillary leaf development at nodes 5 and 9 was reduced by removing of main leaves. On the other hand, decapitation increased axillary leaf development in the middle and upper nodes, and delayed early fruit production. According to their suggestion, cultural practices of tomatoes which remove leaves or apical buds also affect canopy leaf development and distribution.

Campos *et al.* (1987) conducted an experiment in Brazil to determine the effect of stem pruning and plant population on tomato productivity. They observed that the early yield and fruit weight were increased by stem pruning, but both yield and fruit number plant^{-1} were decreased. The highest yield of marketable fruits was gained from control (54.8 tha^{-1}) followed by the variant pruned above the 7th truss (53.07 tha^{-1}). Marketable yield increased from 46.8tha-1 with 20,000 plants ha^{-1} to 54.49 tha^{-1} at the highest density.

Baki (1987) reported in an experiment that pruned plants produced higher yield (96.08 t/ha) and early flowering. Whereas, unpruned plants obtained higher plant height, higher inflorescence number and also, fruit number.

Under the field conditions of Bangladesh Agricultural Research Institute (BARI), Joydebpur during winter season, an experiment was accomplished by Sharfuddin and Ahmed (1986), 1985-86. According to them, unpruned plants produced maximum number (36) of fruits plant^{-1}. The highest yield was 120.50 tha^{-1} and was obtained from unpruned plants followed by one time pruning (100.43 tha^{-1}), two times pruning (98.33 tha^{-1}) and single stem pruning (73.41 tha^{-1}), respectively. However, the highest yield of 123.36 tha^{-1} was obtained from plants pruned to 3 stems and grown at a plant density of 27,777 plants/ha.

In an experiment, Rajendra and Patil (1979) investigated that unpruned tomato plants give higher yield than pruned plants. Maximum fruit weight (89.19 g) was obtained in case of single stem pruned plant. On the otherhand, fruit weight was lowest (63.07 g) in unpruned plants. But, any significance role was not observed on other characters like plant height, days to flowering and first fruit picking.

Orzco *et al.* (1975) executed an field experiment to find out the response of tomato plants to different pruning methods. It was conducted that unpruned plant gave the highest yield (58.09 tha^{-1}) with the removal of 30% flowers followed by 54.44 tha^{-1} in unpruned plants and 47 tha^{-1} from pruned plants with pinching the shoots after 3 months.

Aranjo and Nissio (1974) conducted an experiment to find out the effect of pruning on yield from two field trials with 11 tomato cultivars. They reported that side shoot removal expressively reduced the total and marketable yield and the number of good quality fruit.

CHAPTER III

MATERIALS AND METHODS

This chapter deals with materials and methods that were used in conducting the experiment. It includes a short description of experimental site and duration of the experiment, characteristics of soil, climate, materials used for the experiment, raising of seedlings, layout and design, land preparation, manuring and fertilization, transplantation of seedlings, intercultural operation, harvesting, collection of data and statistical analysis.

3.1 Experimental Period

The experiment was carried out during the period from October 2019 to April 2020.

3.2 Experimental site

The experiment was conducted at the Horticulture farm of Sher-e-Bangla Agricultural University, Dhaka. The location of the site in 23°74" N latitude and 90°35" E longitude with an elevation of 8.2 meter from sea level (Anon, 1989).

3.3 Characteristics of Soil

The soil of the experimental field belongs to the Tejgaon series under the zone Madhupur Tract (AEZ-28). A composite sample was created by collecting soil from several spots of the field at a depth of 0-15 cm before the initiation of the experiment. The collected soil was air dried, grounded and passed through 2 mm sieve and analyzed at Soil Resources Development Institute (SRDI), Khamarbari, Dhaka for some important physical and chemical properties. The soil had a texture of silty clay with pH and organic matter 5.47-5.63 and 0.83%. The soil test report is shown in Appendix II.

3.4 Climatic condition of the experimental site

The experimental site is located in subtropical region where climate is characterized by heavy rainfall during the months of kharif season and scanty rainfall during the months of rabi season. The maximum and minimum temperature, humidity, rainfall and soil temperature during the study period are collected from the Bangladesh Meteorological Department (climate division) and have been presented in Appendix III.

3.5 Planting materials

As test crops, brinjal seeds from the varieties 'BARI Begun-4', 'BARI Begun-7' and 'BARI Begun-10' were used. Seeds were collected from Bangladesh Agricultural Research Institute, Gazipur.

3.6 Germination test

Germination test was performed before seed sowing in the field. Three layers of filter papers were placed on petri dishes. Each petridish contained 100 seeds. Germination percentage was calculated by using the following formula-

$$\text{Germination (\%)} = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds}} \times 100$$

3.7 Treatments of the experiment

The experiment consisted of two factors. Details are presented below:

Factor A: Pruning methods

P_0- Control

P_1- Old leaf remove

P_2- Lateral branch pruning

P_3- Old leaf remove and lateral branch pruning

Factor B: Variety

V_1- BARI begun-4

V_2- BARI begun-7

V_3- BARI begun-10

There are 12 (4 × 3) treatment combinations such as P_0V_1, P_0V_2, P_0V_3, P_1V_1, P_1V_2, P1V3, P_2V_1, P_2V_2, P_2V_3, P_3V_1, P_3V_2, P_3V_3.

3.8 Design and layout of the experiment

The experiment was laid out in a Randomized Complete Block Design (RCBD). Each treatment was replicated for three times. The size of each plot was 1.8 m × 1.8 m and the plant spacing was 60 cm × 45 cm. Total area was divided into three blocks. Each block contained 12 plots. First, second and third block were treated as first, second and third replication, respectively. Every replication had 12 plots where 12 treatments were allotted

randomly. Total number of plot was 36. In each plot, there were 9 plants. There was 30 cm distance from the border of the plot. The distance between two blocks and two plots were 75 cm and 50 cm, respectively. The intra block and plot spaces were used as irrigation and drainage channels. A layout of the experiment has been shown in Fig. 1.

3.9 Raising of seedlings

Brinjal seedlings were raised in seedbeds of 3 m × 1 m size for seedlings. The soil was well prepared and converted into loose friable and dried for seedbed. All weeds and stubbles were removed and well rotten cowdung was mixed with the soil. Three seedbeds were prepared for three varieties. In each seed bed, seeds were sown on 05 October, 2019. After sowing, seeds were covered with light soil. Heptachlor 40 WP was applied @ 4 $kgha^{-1}$ in order to control soil insects. In each seedbed, precautionary measures were taken against ants and worm. The emergence of the seedlings took place with 5 to 6 days after sowing. Weeding, mulching and irrigation were done from time to time as and when needed.

3.10 Land preparation

The selected plot for conducting the experiment was opened in the last week of October 2019 with a power tiller and left exposed to the sun for a week. Field layout was done before according to the design adopted. After one week, the land was harrowed, ploughed and cross-ploughed several times followed by laddering to obtain good tilt. Weeds and stubbles were removed and finally obtained a desirable tilt of soil for transplanting brinjal seedlings. The experimental plot was partitioned into unit plots in accordance with the layout mentioned in Fig. 1. Cowdung, vermicompost and chemical fertilizers as indicated below were mixed with the soil of each unit plot. Drains were made around each plot and the excavated soil was used for raising the plots to about 5 cm high from the soil surface.

3.11 Application of manure and fertilizers

After opening the land, well decomposed cowdung was applied and thoroughly mixed up with soil. Before final land preparation, inorganic fertilizers were applied. Fertilizer and manure dose were calculated on the basis of fertilizer recommendation guide of Bangladesh Agricultural Research Institute (BARI-2019). Total amount of cowdung was

applied during final land preparation. Recommended doses of cowdung (10000 $kgha^{-1}$), urea (300 $kgha^{-1}$), TSP (250 $kgha^{-1}$), MoP (200 $kgha^{-1}$), gypsum (100 $kgha^{-1}$) were applied in the experimental plot after transplanting of seedlings.

3.12 Transplanting of seedlings

25 days old healthy and uniform brinjal seedlings as per experimental treatment were uprooted separately from the seed bed and were transplanted in the experimental plots in the afternoon of 04 November, 2019 maintaining difference as per treatment between the rows and plants. This allowed an accommodation of 9 plants in each plot with a spacing of row to row was 60 cm and plant to plant was 45 cm. The seedbed was watered before uprooting the seedlings from the seedbed so as to minimize damage to the roots. The seedlings were watered after transplanting and continued for several days for their early establishment. Seedlings were also planted around the border area of the experimental plots for gap filling.

3.13 Intercultural operations

After transplanting of seedlings, various intercultural operations such as irrigation, gap filling, stalking, weeding and top dressing etc. were accomplished for better growth and development of the brinjal seedlings.

3.13.1 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.

3.13.2 Staking

Staking was given to each plant by bamboo sticks to keep them erect when needed.

3.13.3 Lateral branch Pruning and old leaf removing

After 30 days of transplanting, pruning was started as per treatment and it was continued till 75 days. The lateral branches were pruned as soon as they started to grow. Pruning was done with the help of secateurs. Old leaves close to soil level and pale in color were removed with the help of secatures. It was started after 30 days of transplanting.

3.13.4 Irrigation

Irrigation was given when necessary. Irrigation was given throughout the growing period. The second irrigation was given 40 days after transplanting followed by irrigation 20 days after the first irrigation. Each fertilizing was followed by irrigation. Each plant was irrigated by a watering cane. Irrigation was supplied through the drains of the plots. Proper drainage facilities were made surrounding the experimental plots for drainage of excess water.

3.13.5 Weeding

Weeding was done as when required. It was done at every 15 days interval after planting followed up to peak flowering stage.

3.13.6 Top dressing

Top dressing of urea was done in 3 equal installments at 15, 30 and 45 DAT. The fertilizers were applied as ring form and mixed well with the soil.

3.14 Plant protection

3.14.1 Insect/Pests

As preventive measures against cut worms, brinjal shoot and fruit borer, leaf hopper, jassids, thrips and others. Malathion 57 EC was applied at the rate of 2 mlL^{-1}. To control shoot and fruit borer, tracer was applied as per suggestion of the company. The insecticide application was made fortnightly for a week after transplanting to a week before first harvesting. Furadan 10 G was also applied during final land preparation as soil insecticide.

3.14.2 Diseases

Precautionary measures against disease infection especially phomopsis fruit rot of brinjal was taken by spraying Bavistin fortnightly at the rate of 2 gL^{-1}.

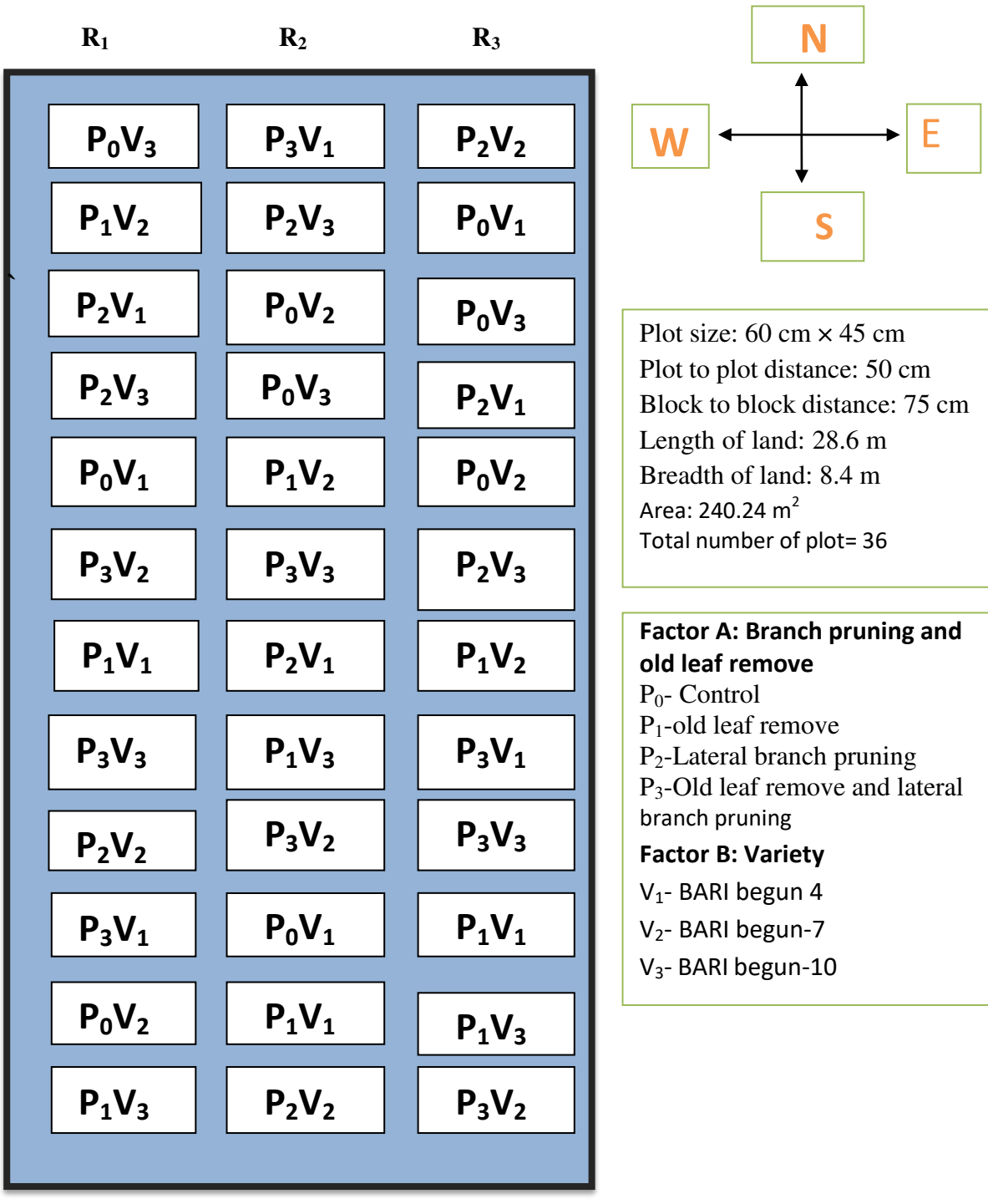

Fig. 1. Field layout of the experimental plot on brinjal in the RandomizedComplete Block Design.

3.15 Harvesting

Brinjal fruits were harvested when they attained full maturity indicating deep violet in color and hard in consistency. Harvesting was started on the 25 January, 2020 and was continued until 20 April, 2020 as economic production.

3.16 Data collection

Six plants were taken from each unit plot for the collection of data. The following data were recorded.

3.16.1 Plant height (cm)

The height of the plants were measured with a meter scale from the ground level to the tip of the longest stem and the mean height were expressed in cm.

3.16.2 Number of leaves per plant

The number of leaves of selected sample plants was counted at 30, 45, 60, 70 days and the average number of leaves per plant was calculated.

3.16.3 Number of branches per plant

The number of branches of plants was counted at 30 days of transplanted seedling age and the average number of branches per plant was calculated.

3.16.4 Days from transplanting to 1st flowering

First visible flower bud was counted from the date of transplanting and the average was calculated.

3.16.5 Number of flowers per plant

We counted the total number of flowers on six plants from each treatment and calculated the mean value.

3.16.6 Number of fruits per plant

The number of fruits per plant was counted and the average number of fruits per plant was calculated.

3.16.7 Fruit length (cm)

The length of fruit was measured with a scale from the neck of the fruit to the bottom of 6 randomly selected marketable fruits from each plant and there average was calculated and expressed in cm.

3.16.8 Fruit diameter (cm)

Diameter of 6 randomly selected marketable fruits from each plant was measured with a slide calipers, and their average was calculated, and expressed in cm.

3.16.9 Individual fruit weight (g)

Individual fruits were weighed in grams (g) and converted individually using a digital weight machine.

3.16.10 Yield per plot (kg)

A balance was used to measure the weight of fruits per plot. It was measured by the total field yield of each unit plot separately during the period from 1st harvesting to final harvesting and was recorded in kilogram (kg).

3.16.11 Yield per hectare (t)

Yield per hectare of brinjal fruits was calculated by converting the weight of plot yield into hectare and was expressed in ton. It was measured by the following formula:

$$\text{Fruit yield per hectare (ton)} = \frac{\text{Fruit yield per plot (kg)} \times 10000}{\text{Area of plot in square meter}}$$

3.17 Statistical analysis

The data recorded for different characters were statistically analyzed. The mean values of all the recorded characters were evaluated and analysis of variance was performed by the 'F' (variance ratio) test. The significance of the difference among the treatment of means was estimated by Duncan's Multiple Range Test (DMRT) at 5% level of probability (Gomez and Gomez, 1984).

3.18 Economic analysis

The cost of production was analyzed in order to find out the most economic variety. All input costs were considered in computing the cost of production. The market price of brinjal was considered for estimating the return. Analyses were done according to the procedure described by Alam *et al.* (1989).

3.19 Analysis for total cost of production

All the material and non-material input cost, interest on fixed capital of land and miscellaneous cost were considered for calculating the total cost of production. Total cost of production (input cost, overhead cost), gross return, net return and BCR (Benefit cost ratio) are presented in Appendix XII.

3.20 Gross income

Gross income was calculated on the basis of sale of fruit. The price of fruit was projected to be Tk. 18/kg on the basis of current market value of Kawran Bazar, Dhaka at the time of harvesting.

3.21 Net return

Net return was calculated by deducting the total production cost from gross income for each treatment combination.

Net return = Gross return per hectare (Tk.) - Total cost of production per hectare (Tk.)

3.22 Benefit cost ratio (BCR)

The benefit cost ratio (BCR) was calculated as follows:

Benefit cost ratio (BCR) = Gross return per hectare (Tk.) /Total cost of production per hectare (Tk.)

CHAPTER IV

RESULTS AND DISCUSSION

This chapter comprises presentation and discussion of the results obtained from the study to determine the effect of different pruning methods on the growth and yield of three brinjal varieties. The results of the growth and yield characters of brinjal as influenced by different pruning methods and varieties have been presented, and discussed in this chapter.

Plant height

The height of the plants was measured solely during the growing period. Brinjal plant height varied substantially owing to different pruning methods (Table 1, Appendix IV). The tallest plant (80.82 cm) was found from P_3 treatment (old leaf remove and lateral branch pruning), and the shortest plant (70.78 cm) was found from P_0 treatment (control) at 70 DAT. If proper pruning practice is followed, it will alter brinjal development and yield. But, this element is often neglected by farmers. Similar result was also found by Srinivasan *et al.* (1999), Poksoy *et al.* (1993), Poksoy *et al.* (1993) and Maboko *et al.* (2011). They opined that pruned plants grow taller than unpruned plants.

Significant variation was found among the varieties in case of plant height (Appendix IV and Table 2). Plant height of brinjal varied significantly due to different variety at 30, 45, 60 and 70 DAT. The variety V_3 (BARI Begun-10) produced the tallest plant (81.49 cm) while variety V_1 (BARI Begun-4) produced the shortest plant (70.72 cm) in height at 70 DAT.

Plant height varied significantly due to different treatment combinations of pruning treatments and brinjal variety (Appendix IV and Table 3). At 70 DAT, the highest plant height (86.98 cm) was observed from the treatment combination of P_3V_3. The lowest plant height (63.25 cm) at 70 DAT was observed from P_0V_1 treatment combination.

Table 1. Effect of pruning on plant height at different days after transplanting of brinjal

Treatments	Plant height (cm)			
	30 DAT	45 DAT	60 DAT	70 DAT
P_0	15.91 c	42.69 d	59.91 d	70.78 d
P_1	18.83 b	46.03 c	65.58 c	74.58 c
P_2	18.04 b	49.41 b	68.40 b	78.00 b
P_3	22.17 a	53.90 a	71.28 a	80.82 a
LSD(0.05)	0.97	0.81	1.44	1.46
CV%	5.35	1.73	2.24	1.97

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1 = Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning

Table 2. Effect of variety on plant height at different days after transplanting of brinjal

Treatments	Plant height (cm)			
	30 DAT	45 DAT	60 DAT	70 DAT
V_1	16.28 c	40.15 c	59.02 c	70.72 c
V_2	17.53 b	50.53 b	66.72 b	75.92 b
V_3	22.41 a	53.35 a	73.14 a	81.49 a
LSD(0.05)	0.84	0.70	1.25	1.26
CV%	5.35	1.73	2.24	1.97

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Table 3. Combined effect of variety and pruning on plant height at different days after transplanting of brinjal

Treatments	Plant height (cm)			
	30 DAT	45 DAT	60 DAT	70 DAT
P_0V_1	13.23 g	34.22 i	53.33 h	63.25 h
P_0V_2	16.98 d	45.20 f	60.63 f	71.87 g
P_0V_3	17.51 d	48.64 e	65.76 e	77.22 de
P_1V_1	16.49 de	38.97 h	57.25 g	69.61 g
P_1V_2	17.80 d	48.90 de	65.50 e	74.84 ef
P_1V_3	22.21 b	50.23 d	73.99 bc	79.28 cd
P_2V_1	14.18 fg	41.20 g	61.08 f	74.53 f
P_2V_2	15.15 ef	52.39 c	69.02 d	76.99 def
P_2V_3	24.80 a	54.64 b	75.09 b	82.47 b
P_3V_1	21.20 bc	46.19 f	64.40 e	75.50 ef
P_3V_2	20.20 c	55.61 b	71.71 c	79.97 bc
P_3V_3	25.10 a	59.89 a	77.73 a	86.98 a
LSD(0.05)	1.69	1.40	2.51	2.53
CV%	5.35	1.73	2.24	1.97

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Number of leaves

Number of leaves per plant is considered as an major parameter of crop plant due to its physiological role in photosynthetic activities. Significant variation in plant height was observed by pruning treatment. Maximum number of leaves/plant (47.27) were found in control (P_0) treatment and minimum number of leaves per plant (41.03) were found in both treatment of lateral branch pruning and old leaf remove (P_3) (Table 4 and Appendix V) at 70 DAT. It may be due to the leaf assimilates availability. Similar trend of result was also found by Maboko *et al*. (2009).

Table 4. Effect of pruning on number of leaves at different days after transplanting of brinjal

Treatments	Number of leaves per plant			
	30 DAT	**45 DAT**	**60 DAT**	**70 DAT**
P_0	7.57 b	23.17 a	35.70 a	47.27 a
P_1	8.74 a	21.10 b	33.50 b	45.03 b
P_2	7.56 b	18.40 c	31.83 c	42.29 c
P_3	8.40 a	16.90 d	30.50 d	41.03 d
LSD(0.05)	0.34	0.58	0.59	0.71
CV%	4.32	3.01	1.85	1.66

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1 = Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning

Table 5. Effect of variety on number of leaves at different days after transplanting of brinjal

Treatments	Number of leaves per plant			
	30 DAT	**45 DAT**	**60 DAT**	**70 DAT**
V_1	8.98 a	23.23 a	36.40 a	49.04 a
V_2	6.98 c	16.85 c	30.25 c	40.10 c
V_3	8.24 b	19.60 b	32.00 b	42.56 b
LSD(0.05)	0.29	0.50	0.51	0.61
CV%	4.32	3.01	1.85	1.66

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Number of leaves varied significantly due to different varieties of brinjal (Appendix V and Table 5). It was observed that BARI Begun-4 (V_1) produced the highest leaf number at 30, 45, 60 and 70 DAT. However, BARI Begun-7 (V_2) produced the lowest number of leaves at 30, 45, 60 and 70 DAT. The maximum number of leaves (49.04) was recorded in BARI Begun-4 (V_1) while the minimum number of leaves (40.1) was recorded in BARI Begun-7 (V_2) at 70 DAT.

Number of leaves varied significantly due to different treatment combinations of variety and pruning at 30, 45, 60 and 70 DAT (Appendix V and Table 6). At 70 DAT, the

maximum number of leaves (52.30) was recorded from the treatment combination of P_0V_1 while the minimum number of leaves (37.0) was recorded in P_3V_2. From the above result, it revealed that BARI Begun-4 produced higher leaf number at control.

Table 6. Combination effect of variety and pruning on leaves number at different days after transplanting of brinjal

Treatments	Number of leaves per plant			
	30 DAT	**45 DAT**	**60 DAT**	**70 DAT**
P_0V_1	8.00 c	26.30 a	40.30 a	52.30 a
P_0V_2	6.90 ef	20.40 c	32.30 d	43.60 e
P_0V_3	7.80 cd	22.80 b	34.50 c	45.90 d
P_1V_1	10.01 a	23.10 b	37.60 b	50.40 b
P_1V_2	7.30 de	18.90 d	30.30 ef	40.90 f
P_1V_3	8.90 b	21.30 c	32.60 d	43.80 e
P_2V_1	8.30 c	22.40 b	35.20 c	47.67 c
P_2V_2	6.32 f	14.70 f	29.20 g	38.90 g
P_2V_3	8.07 c	18.10 d	31.10 e	40.30 f
P_3V_1	9.60 a	21.10 c	32.50 d	45.80 d
P_3V_2	7.40 de	13.40 g	29.20 g	37.00 h
P_3V_3	8.20 c	16.20 e	29.80 fg	40.30 f
LSD(0.05)	0.59	1.01	1.02	1.23
CV%	4.32	3.01	1.85	1.66

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Number of branches

Significant variation in branch number was observed by pruning treatment. Maximum number of branches/plant were found in P_0 (control) treatment which was statistically identical with P_1 (old leaf remove) and minimum number of branches/plant were found in both treatment of P_3 (old leaf remove and lateral branch pruning) (Table 7). Branch number was highest at 30, 45, 60 and 70 DAT in control treatment and lowest in old leaf remove and lateral branch pruning treatment. Reduction of older leaves reduces the risk of diseases and increases the availability of light. It increases the rate of photosynthesis and improves vegetative growth of plants.

Table 7. Effect of pruning on number of branches at different days after transplanting of brinjal

Treatments	Number of branches per plant			
	30 DAT	45 DAT	60 DAT	70 DAT
P_0	4.53 a	8.40 a	11.82 a	15.33 a
P_1	4.39 a	7.45 b	10.83 b	14.47 b
P_2	4.00 b	6.57 c	10.13 c	13.69 c
P_3	3.88 b	5.90 d	9.40 d	13.03 d
LSD(0.05)	0.32	0.33	0.50	0.45
CV%	8.01	4.85	4.93	3.27

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1 = Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning

Table 8. Effect of variety on number of branches at different days after transplanting of brinjal

Treatments	Number of branches per plant			
	30 DAT	45 DAT	60 DAT	70 DAT
V_1	4.98 a	8.08 a	12.21 a	16.11 a
V_2	3.40 c	6.38 c	9.375 c	12.59 c
V_3	4.22 b	6.80 b	10.05 b	13.70 b
LSD(0.05)	0.2847	0.2910	0.4399	0.3913
CV%	8.01	4.85	4.93	3.27

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Number of branches varied significantly due to brinjal varieties (Appendix V and Table 8). It was observed that V_1 (BARI Begun-4) produced the maximum number of branches at 30, 45, 60 and 70 DAT. However, V_2 (BARI Begun-7) produced the lowest number of branches at 30, 45, 60 and 70 DAT. The maximum number of branches at 70 DAT was 16.11 (V_1 treatment) and the minimum number of branches was 12.59 (V_2 treatment).

Number of branches varied significantly due to various treatment combinations of variety and pruning treatments at 30, 45, 60 and 70 DAT (Appendix V and Table 9). At 70 DAT, the maximum number of branches (17.73) was recorded from the treatment combination of P_0V_1 while the minimum number of branches (11.4) was recorded in P_3V_2. It revealed that BARI Begun-4 had the maximum branches at control treatment.

Table 9. Combination effect of variety and pruning on number of branches at different days after transplanting of brinjal

Treatments	Number of branches per plant			
	30 DAT	**45 DAT**	**60 DAT**	**70 DAT**
P_0V_1	5.42 a	9.70 a	13.75 a	17.73 a
P_0V_2	3.70 ef	7.60 cd	10.10 de	13.77 ef
P_0V_3	4.46 bcd	7.90 c	11.60 c	14.50 de
P_1V_1	5.01 ab	8.50 b	12.50 b	16.60 b
P_1V_2	3.65 ef	6.80 ef	9.90 ef	12.70 g
P_1V_3	4.5b c	7.10 de	10.10 de	14.10 de
P_2V_1	4.80 b	7.40 cd	11.70 bc	15.40 c
P_2V_2	3.21 fg	5.90 gh	9.30 ef	12.48 g
P_2V_3	4.00 cde	6.40 fg	9.40 ef	13.20 fg
P_3V_1	4.70 b	6.70 ef	10.90 cd	14.70 cd
P_3V_2	3.04 g	5.20 i	8.20 g	11.40 h
P_3V_3	3.90 de	5.80 h	9.10 f	13.00 fg
LSD(0.05)	0.56	0.58	0.87	0.78
CV%	8.01	4.85	4.93	3.27

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Days to 1st flowering of brinjal

In case of pruning treatment, significant variation in days to first flowering was observed. Maximum days required for first flower (72.29 days) was found in control (P_0) treatment whereas minimum number of days (67.46 days) required was found in the lateral branch pruning with removal of old leaf (P_3) treatment (Table 10 and Appendix VII).

The maximum days (71.71 days) were required for days to 1st flowering in V_3 (BARI Begun-10) and the minimum (67.96 days) were taken by V_2 (BARI Begun-7) (Table 11 and Appendix VII).

Days required for 1st flowering varied significantly due to various treatment combinations of brinjal variety and pruning treatments (Table 12 and Appendix VII). The maximum days required for 1st flowering (74.17) was observed in the treatment combination of P_0V_3 which is statistically similar with P_1V_3 while the minimum days for 1st flowering (65.10) was observed in P_3V_2 treatment combination.

Number of flowers

The number of flowers/plant varied significantly in different pruning treatments. Maximum number of flower (38.87) were found in treatment of lateral branch pruning with old leaf removal (P_3) treatment and minimum number of flower (26.24) were found in control treatment (P_0) (Table 10 and Appendix VII). Similar results were reported by Islam (2016). He observed that removing of leaves enhances flower production.

Number of flowers per plant was exposed significantly with brinjal varieties (Appendix VII and Table 11). The maximum number of flowers per plant (41.23) was recorded in V_1 (BARI Begun-4) whereas the minimum number of flowers per plant (26.07) was recorded from BARI V_3 (Begun-10).

Number of flowers per plant varied significantly due to different treatment combinations of brinjal variety and pruning treatments (Appendix VII and Table 12). The maximum number of flowers per plant (49.20) observed from the treatment combination of P_3V_1 whereas, minimum number of flowers per plant was observed from P_0V_3 combination which was 22.10.

Fruit length

Fruit length did not vary significantly due to various pruning treatments (Appendix VIII and Table 10). It was observed that the longest fruit (16.50 cm) was observed with P_3 which was statistically identical with P_0, P_1 and P_2.

On the otherhand, fruit length was significantly influenced with brinjal varieties (Appendix VI and Table 11). The longest fruits (19.81 cm) were recorded in V_3 (BARI Begun-10) whereas the shortest fruits (11.77 cm) were recorded in V_1 (BARI Begun-4).

Fruit length varied significantly due to various treatment combinations of brinjal variety and pruning (Appendix VIII and Table 12). The longest fruit length (20.90 cm) was observed from the treatment combination of P_3V_3 which was statistically similar with

P_1V_3 and P_2V_3 while the shortest fruit length (11.06 cm) was observed from P0V1 which was statistically similar with P_1V_1 and P_3V_1.

Fruit diameter

Fruit diameter did not vary significantly due to various pruning treatments (Appendix VIII and Table 10). It was observed that the widest fruit (3.44) was obtained from P_3 which was identical with P_0, P_1 and P_2 treatment.

Fruit diameter was significantly influenced with brinjal varieties (Appendix VIII and Table 11). The widest fruits (3.75 cm) were recorded in V_3 (BARI Begun-10) which was statistically similar with BARI Begun-7 whereas the narrowest fruits (3.08 cm) were recorded in V_1 (BARI Begun-4) which was statistically similar with BARI Begun-7.

Fruit diameter did not vary significantly due to various treatment combinations of brinjal variety and pruning (Appendix V and Table 12). The widest fruit (3.86) was observed from the treatment combination of P_2V_3 while the narrowest fruit (2.68) was observed from P_1V_1.

Table 10. Effect of pruning on the different flowering and fruit characters of brinjal

Treatments	Days to 1st flowering	Number of flower per plant	Fruit length (cm)	Fruit diameter
P_0	72.29 a	26.24 d	15.50	3.21
P_1	70.93 b	30.46 c	16.13	3.27
P_2	69.24 c	33.80 b	16.50	3.42
P_3	67.46 d	38.87 a	16.41	3.44
LSD	0.78	1.1450	1.3174NS	NS
CV %	1.15	3.62	8.35	14.22

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P1 = Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning

Table 11. Effect of variety on the different flowering and fruit characters of brinjal

Treatments	Days to 1st flowering	Number of flower per plant	Fruit length (cm)	Fruit diameter
V_1	70.27 b	41.23 a	11.77 c	3.08 b
V_2	67.96 c	29.73 b	16.83 b	3.17 ab
V_3	71.71 a	26.07 c	19.81 a	3.75 a
LSD	0.68	0.99	1.14	0.66
CV %	1.15	3.62	8.35	14.22

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Table 12. Combined effect of variety and pruning on the different flowering and fruit characters of brinjal

Treatments	Days to 1st flowering	Number of flower per plant	Fruit length (cm)	Fruit diameter
P_0V_1	72.30 bc	31.20 e	11.06 f	3.35
P_0V_2	70.40 de	25.41 hi	16.95 d	2.88
P_0V_3	74.17 a	22.10 j	18.5 bcd	3.41
P_1V_1	71.10 cd	39.80 c	11.30 ef	2.68
P_1V_2	68.50 fg	27.30 gh	16.50 d	3.31
P_1V_3	73.18 ab	24.27 i	20.60 ab	3.80
P_2V_1	69.80 def	44.70 b	13.40 e	2.80
P_2V_2	67.83 g	29.10 fg	29.10 fg	3.59
P_2V_3	70.10 de	27.60 g	19.24 abc	3.86
P_3V_1	67.87 g	49.20 a	11.31 ef	3.50
P_3V_2	65.10 h	37.10 d	17.02 cd	2.90
P_3V_3	69.40 ef	30.30 ef	20.90 a	3.92
LSD(0.05)	1.36	1.98	2.28	NS
CV%	1.15	3.62	8.35	14.22

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning, V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Average fruit weight

In case of pruning treatment, average fruit weight varied significantly. Maximum weight/fruit (78.03 g) was found in both treatment of lateral branch pruning and old leaf remove (P_3) treatment and minimum weight/fruit (74.18 g) was in control treatment (P_0) (Table 13) which was statistically similar with P_1. Islam (2016) and Goda, Y. *et al.* (2014) reported similar result. They stated that defoliation and pruning in general enhance fruit size for growing vigorously plants.

Average fruit weight of brinjal per plant was influenced significantly by brinjal variety (Appendix VIII and Table 14). V_3 (BARI Begun-10) variety gave the maximum average fruit weight (92.33 g) and the minimum fruit weight (59.11 g) was recorded in V_1 (BARI Begun-4) variety.

Fruit weight varied significantly due to various treatment combinations of brinjal variety and pruning treatments (Appendix VIII and Table 15). The maximum average fruit weight (94.80 g) was recorded from the treatment combination of P_3V_3 and the minimum average fruit weight (57.19 g) was observed from P_0V_1 which was statistically similar to P_1V_1.

Number of fruits

The number of fruit/plant varied significantly in case of pruning treatment. Maximum number of fruit/plant (27.83) were found in both lateral branch pruning and old leaf remove (P_3) treatment and minimum number of fruits (17.85) were found in control treatment (P_0) (Table 13). Islam (2016), Maboko *et al.* (2009) reported in his experiment that pruning resulted in a higher fruit number in general.

Number of fruit per plant was significantly influenced with brinjal varieties (Appendix VII and Table 14). The maximum number of fruit (29.23) was recorded in V_1 (BARI Begun-4) whereas, the minimum number of fruit (17.91) was recorded in V_3 (BARI Begun-10).

Number of fruits per plant varied significantly due to various treatment combinations of brinjal variety and pruning treatments (Appendix VII and Table 15). The maximum number of fruits per plant (33.64) observed from the treatment combination of P_3V_1 whereas, the minimum number of fruits per plant (16.10) was observed from P_0V_3 treatment combination.

Yield per plant

Yield/plant varied significantly in pruning treatment. Maximum yield/ plant (1.79 kg) were found in both treatment of lateral branch pruning and old leaf remove (P_3) treatment and minimum yield/plant (1.56 kg) was found in control (P_0) pruning treatment (Table 13 and Appendix IX). Through P_1 and P_2 treatment higher yield/plant was also obtained to some extent.

It was observed from the results of the present experiment that different brinjal variety significantly varied with the yield per plant (Appendix IX and Table 14). The maximum yield per plant (1.90 kg/plant) was recorded in V_1 (BARI Begun-4) while minimum yield per plant (1.41 kg/plant) was found from V_2 (BARI Begun-7).

Yield per plant varied significantly due to various treatment combinations of brinjal variety and pruning treatment (Appendix IX and Table 15). The maximum yield per plant (2.01 kg) was observed from the treatment combination of P_3V_1 whereas the minimum yield per plant (1.30 kg) was observed from P_0V_2 treatment combination. Similar report was stated by Maboko *et al.* (2009), Hesamil *et al.* (2012), Alsadon *et al*. (2013), Islam (2016). They observed that pruning helps in increasing fruit yield.

Yield per plot

Yield per plot varied significantly due to various pruning treatments (Appendix IX and Table 13). Maximum yield/plant (16.11 kg) were found in both treatment of lateral branch pruning and old leaf remove (P_3) treatment and minimum yield/plant (14.00 kg) was found in control (P_0) pruning treatment. Through P_1 and P_2 treatment higher yield/plant was also obtained to some extent.

It was observed that different brinjal variety significantly varied with the yield per plot (Appendix IX and Table 14). The maximum yield per plot (17.12 kg) was recorded in V_1 (BARI Begun-4) while the minimum yield per plot (12.66 kg) was recorded in V_2 (BARI Begun-7).

Yield per plant varied significantly due to various treatment combinations of brinjal variety and pruning treatment (Appendix IX and Table 15). The maximum yield per plant (18.05 kg) was observed from the treatment combination of P_3V_1 whereas the minimum yield per plant (11.69 kg) was observed from P_0V_2 treatment combination.

Yield per hectare

Yield per plot varied significantly due to various pruning treatments (Appendix IX and Fig. 2). Maximum yield/ plant (49.73 ton) were found in both treatment of lateral branch pruning and old leaf removal (P_3) treatment and minimum yield/plant (43.22 ton) was found in control (P_0) pruning treatment (Fig. 3). Through P_1 and P_2 treatment higher yield/plant was also obtained to some extent. Additionally, this result was consistent with Muhammad (2007), Maboko *et al.* (2009), Hesamil *et al.* (2012), Alsadon *et al.* (2013), Islam (2016).

It was observed that different brinjal variety significantly varied with the yield of brinjal (Appendix IX and Figure 4). The maximum yield (52.83 t/ha) was recorded in V_1 (BARI Begun-4) while the minimum yield per plot (39.06 t/ha) was recorded in V_2 (BARI Begun-7).

Combined effect between different pruning treatments and variety showed a statistically significant variation for fruit yield per hectare. Yield per plant varied significantly due to various treatment combinations of brinjal variety and pruning treatment (Appendix IX and Table 15). The maximum yield per plant (55.70 kg) was observed from the treatment combination of P_3V_1 whereas the minimum yield per plant (36.08 kg) was observed from P_0V_2 treatment combination.

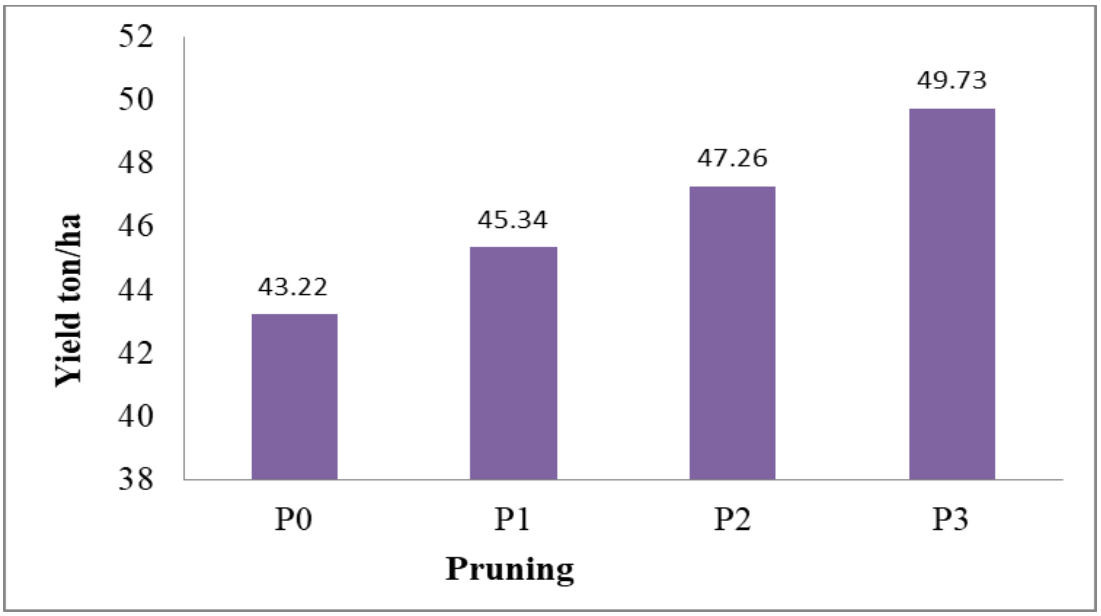

Fig. 2. Effect of pruning on yield of brinjal (t/ha).

Where P_0 = Control, P_1 = Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning

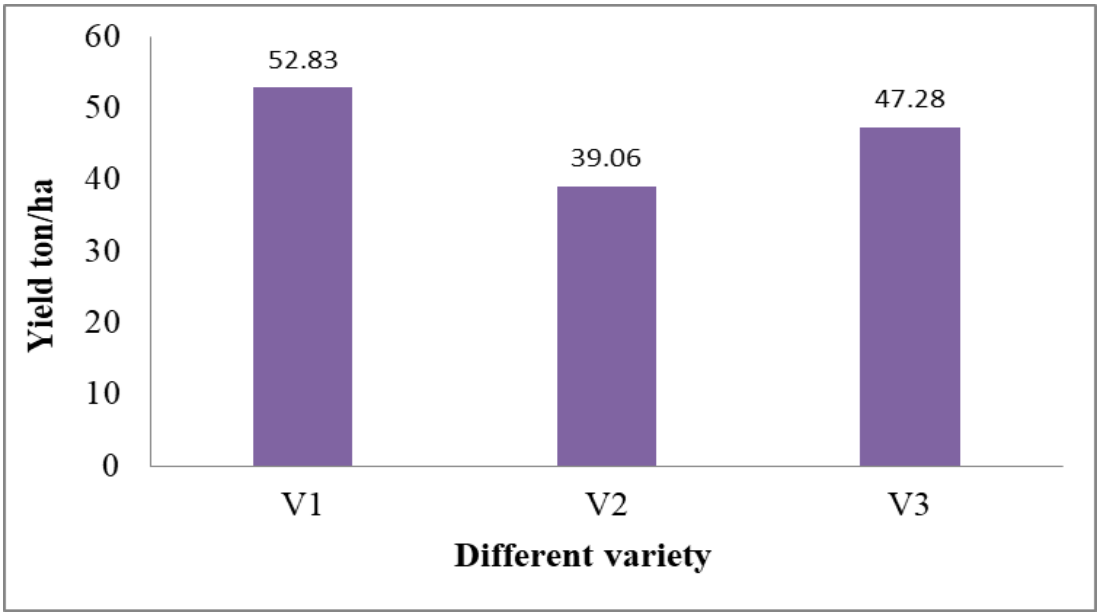

Fig. 3. Effect of variety on yield of brinjal (t/ha).

Where V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Table 13. Effect of pruning on different yield of brinjal

Treatments	Average fruit weight (g)	Number of fruit/plant	Yield/plant (kg)	Yield/plot (kg)
P_0	74.18 c	17.85 d	1.56 d	14.00 d
P_1	75.22 bc	22.16 c	1.63 c	14.69 c
P_2	75.85 b	23.06 b	1.70 b	15.31 b
P_3	78.03 a	27.83 a	1.79 a	16.11 a
LSD	1.06	0.57	0.03	0.34
CV %	1.44	2.61	2.34	2.34

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1 = Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning

Table 14. Effect of variety on different yield of brinjal

Treatments	Averagefruit weight (g)	Number of fruit/plant	Yield/plant (kg)	Yield/plot (kg)
V_1	59.11 c	29.23 a	1.90 a	17.12 a
V_2	76.02 b	21.03 b	1.41 c	12.66 c
V_3	92.33 a	17.91 c	1.70 b	15.32 b
LSD	0.92	0.50	0.03	0.29
Treatments	59.11 c	29.23 a	1.90 a	17.12 a

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Table 15. Combined effect of pruning and variety on different yield of brinjal

Treatments	Averagefruit weight (g)	Number of fruit/plant	Yield/plant (kg)	Yield/plot (kg)	Yield (t/ha)
P_0V_1	57.19 g	19.60 e	1.81 c	16.26 c	50.19 c
P_0V_2	74.87 d	17.83 fg	1.30 i	11.69 i	36.08 i
P_0V_3	90.48 b	16.10 h	1.56 f	14.06 f	43.40 f
P_1V_1	58.53 fg	31.30 c	1.87 bc	16.79 bc	51.83 bc
P_1V_2	75.23 d	17.87 fg	1.37 h	12.30 h	37.97 h
P_1V_3	91.90 b	17.30 g	1.66 e	14.97 e	46.20 e
P_2V_1	59.32 f	32.40 b	1.93 b	17.37 b	53.60 b
P_2V_2	76.09 cd	18.20 fg	1.44 g	12.92 g	39.88 g
P_2V_3	92.14 b	18.57 f	1.74 d	15.65 d	48.30 d
P_3V_1	61.40 e	33.64 a	2.01 a	18.05 a	55.70 a
P_3V_2	77.90 c	30.20 d	1.52 f	13.70 f	42.30 f
P_3V_3	94.80 a	19.67 e	1.84 c	16.59 c	51.20 c
LSD(0.05)	1.85	1.00	0.06	0.59	1.83
CV%	1.44	2.61	2.34	2.34	2.34

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning, V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Economic analysis

Input costs for land preparation, seed cost, fertilizer & manure cost and man power required for all the operations from transplanting of seedling to harvesting of brinjal, interest on fixed capital of land (Leased land by loan basis) and miscellaneous cost were calculated for unit plot and converted into cost per hectare (Table 16 and Appendix XII) . Prices of brinjal were considered in market rate basis of Karwan Bazar, Dhaka. The economic analysis was done to find out the gross and net return and the benefit cost ratio in the present experiment and presented under the following headings:

Gross return

The combination of different variety and pruning treatments showed different values in terms of gross return under the trial (Table 15). The highest gross return (Tk. 10,02,600) was found from the treatment combination of P_3V_1 and the second highest gross return (Tk. 9,64,800) was obtained in P_2V_1 treatment combination. The lowest gross return (Tk. 6,49,440) was obtained from P_0V_2 treatment combination.

Net return

In case of net return, different treatment combination showed different levels of net return under the present trial (Table 15). The highest net return (Tk. 6,79,649) was obtained from the treatment combination of P_3V_1 and the second highest net return (Tk. 6,42,931) was found from the treatment combination of P_2V_1. The lowest (Tk. 3,35,141) net return was found from P_0V_2 treatment combination.

Benefit cost ratio

The combination of different variety and pruning treatments for benefit cost ratio was different in all treatment combination (Table 15). The highest benefit cost ratio (3.1) was found from the treatment combination of P_3V_1 and the second highest benefit cost ratio (2.9) was found from P_2V_1 treatment combination. The lowest benefit cost ratio (2.1) was found from the P_0V_2 treatment combination. From the economic point of view, it was apparent from the above results that the treatment combination of P_3V_1 was more profitable than rest of treatment combinations.

Table 16. Combination effect of variety and pruning on total net return contributing characters and yield of brinjal

Treatments	Cost of production	Yield of brinjal (t/ha)	Gross return (Tk./ha)	Net return (Tk./ha)	Benefit cost ratio
P_0V_1	314299	50.19	903420	589121	2.87
P_0V_2	314299	36.08	649440	335141	2.1
P_0V_3	314299	43.40	781200	466901	2.45
P_1V_1	321869	51.83	932940	611071	2.89
P_1V_2	321869	37.97	683460	361591	2.12
P_1V_3	321869	46.20	831600	509731	2.58
P_2V_1	321869	53.60	964800	642931	2.9
P_2V_2	321869	39.88	717840	395971	2.23
P_2V_3	321869	48.30	869400	547531	2.7
P_3V_1	322951	55.70	1002600	679649	3.1
P_3V_2	322951	42.30	761400	438449	2.36
P_3V_3	322951	51.20	921600	598649	2.85

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning ,V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10,

Rate of brinjal (18 Tk/kg) in peak period at Karwan Bazar, Dhaka

Net return = Gross return per hectare (Tk.) - Total cost of production per hectare (Tk.)

Benefit cost ratio (BCR) = Gross return per hectare (Tk.) /Total cost of production per hectare (Tk.)

CHAPTER V

SUMMARY AND CONCLUSION

The experiment was carried out at the Sher-e-Bangla Agricultural University Horticulture Farm to explore the role of pruning methods on growth, yield and profitability of brinjal under three varieties during the period from October 2019 to April 2020. The two factor experiment included 4 pruning treatments viz. P_0 (cnotrol), P_1 (old leaf remove), P_2 (lateral branch pruning) and P_3 (old leaf remove and lateral branch pruning) and 3 brinjal varieties viz. V_1 (BARI Begun-4), V_2 (BARI Begun-7), V_3 (BARI Begun-10). The experiment with two factors was designed using a Randomized Complete Block Design (RCBD) with three replications. Data was gathered on the following variables: plant height, number of leaves, number of branches per plant, days required to first flowering, number of flowers per plant, number of fruits per plant, fruit length, fruit diameter, average fruit weight, yield per plant, yield per plot, yield per hectare. Using Statistic 10 software, the captured data on various parameters were statistically examined.

Plant height ranged from 63.25 cm – 86.98 cm. The maximum height of a plant 80.82 cm was recorded for P_3 and lowest 70.78 cm for P_0. In case of variety, highest value of plant height 81.49 cm was recorded for V_3 and lowest 70.72 cm was recorded from V_1 treatment. And for the combined effect, the highest value of plant height 86.98 cm was obtained with the P_3V_3 treatment combination and the lowest value of plant height 63.25 cm was obtained with the P_0V_1 treatment combination.

The highest number of leaves per plant (47.27) was observed in the P_0 treatment, while the minimum number of leaves per plant (41.03) was observed in the P_3 treatment. In the case of variety, the highest number of leaves per plant (49.04) was observed in the V_1 treatment, while the lowest number of leaves per plant (40.10) was observed in the V_2 treatment. And for the combined effect, the highest number of leaves per plant (52.30) was observed when P_0V_1 treatment combination, while the lowest number of branches per plant (37.0) was observed when P_3V_2 treatment was combined.

The highest number of branches per plant (15.33) was observed in the P_0 treatment, while the minimum number of branches per plant (13.03) was observed in the P_3 treatment in

case of pruning. In the case of variety, the highest number of branches per plant (16.11) was observed in the V_1 treatment, while the lowest number of branches per plant (12.59) was observed in the V_2 treatment. And for the combined effect, the highest number of branches per plant (17.73) was observed when P_0V_1 treatment combination, while the lowest number of branches per plant (11.4) was observed when P_3V_2 treatment was combined.

The highest number of days required to first flowering (72.29) was obtained with the P_0 treatment, while the lowest number (67.46) was obtained with the P_3 treatment in case of pruning. In terms of variety, the V_3 treatment had the highest days required from sowing to first flowering (71.71), while the V_2 treatment had the lowest (67.96). And for the combined effect, the highest number of days required to sow to first flowering 74.17 was obtained from the treatment combination P_0V_3, while the lowest number of days required to sow to first flowering 65.10 was obtained from the treatment combination P_3V_2.

The number of flowers on each plant varies between 22.1 and 49.20. In P_3, the highest number of flowers per plant was found (38.87) while the lowest number was found in P_0 (26.24). In terms of variety, V_1 had the highest value of flowers per plant (41.23) and V_3 had the lowest number (26.07). In terms of combined effect, the combination of (49.20) P_3V_1 treatments resulted in the highest number flowers per plant when compared to other treatments.

Fruit length did not vary significantly due to various pruning treatments. Fruit length was significantly influenced with brinjal varieties. The longest fruits (19.81 cm) were recorded in BARI Begun-10 (V_3) whereas the shortest fruits (11.77 cm) were recorded in BARI Begun-4 (V_1). The longest fruit length (20.90 cm) was observed from the treatment combination of P_3V_3 which was statistically similar with P_1V_3 and P_2V_3 while the shortest fruit length (11.06 cm) was observed from P_0V_1 which was statistically similar with P_1V_1 and P_3V_1.

Fruit diameter did not vary significantly due to various pruning treatments. Fruit diameter was significantly influenced with brinjal varieties. The widest fruits (3.75 cm) were recorded in BARI Begun-10 (V_3) which was statistically similar with BARI Begun-7

whereas, the narrowest fruits (3.08 cm) were recorded in BARI Begun-4 (V_1) which was statistically similar with BARI Begun-7. Fruit diameter did not vary significantly due to various treatment combinations of brinjal variety and pruning treatments. Average fruit weight varied significantly due to various treatment combinations of brinjal variety and pruning treatments.

P_3 treatment resulted in the highest fruit weight (78.03 g), while P0 treatment resulted in the lowest individual fruit weight (74.18 g). In terms of variety, the V_3 treatment resulted in the highest fruit weight (92.33 g), while the V_1 treatment resulted in the lowest fruit weight (59.11 g). Taking the combined effect into account, the P_3V_3 treatment combination resulted in the highest individual weight (94.80 g).

The highest number of fruit/plant (27.83) were found in both lateral branch pruning and old leaf remove (P_3) treatment and lowest number of fruits (17.85) were found in control treatment (P_0). In terms of variety, the maximum number of fruit (29.23) was recorded in V_1 whereas the minimum number of fruit (17.91) was recorded in V_3. In case of combined effect, the maximum number of fruits per plant (33.64) observed from the treatment combination of P_3V_1 whereas, the minimum number of fruits per plant (16.10) was observed from P_0V_3 treatment combination.

Maximum yield/ plant (1.79 kg) were found in P_3 treatment and minimum yield/plant (1.56 kg) was found in P_0 treatment. The maximum yield per plant (1.90 kg/plant) was recorded in V_1 while minimum yield per plant (1.41 kg/plant) was found from V_2 treatment. The highest yield per plant (2.01 kg) was observed from the treatment combination of P_3V_1 whereas, the lowest yield per plant (1.30 kg) was observed from P_0V_2 treatment combination.

The P_3 treatment (16.11 kg) produced the highest fruit yield per plot of brinjal. In comparison to other treatments, P_0 produced the lowest yield per plot (14 kg). In comparison to other treatments, the V_1 treatment (17.12 kg) produced the highest fruit yield per plot and the V_2 treatment (12.66 kg) produced the lowest fruit yield per plot. Taking into account the combined effect, the P_3V_1 treatment combination produced the

highest fruit yield per plot (18.05 kg), while the P_0V_2 treatment combination produced the lowest fruit yield per plot (11.69 kg).

In comparison with other treatments, maximum yield/ plant (49.73 ton) were found in P_3 treatment and minimum yield/plant (43.22 ton) was found in P_0 treatment. The maximum yield (52.83 t/ha) was recorded in V_1 while the minimum yield per plot (39.06 t/ha) was recorded in V_2. The maximum yield per plant (55.70 kg) was observed from the treatment combination of P_3V_1 whereas, the minimum yield per plant (36.08 kg) was observed from P_0V_2 treatment combination.

Conclusion

The following conclusion can be formed based on the results of this experiment:

- Pruning treatment P_3 (old leaf remove and lateral branch pruning) showed the best result in most of the growth and yield contributing parameters.
- In the experiment, treatment V_1 (BARI Begun-4) performed the best in comparison with others.
- The treatment combination of P3V1 (BARI Begun-4 with lateral branch pruning and old leaf remove) showed the best potentiality of 55.7 t/ha with TK. 6,79,649 net income and 3.1 BCR.
- Additional research of this kind may be conducted for improved authentication, depending on the circumstances**.**

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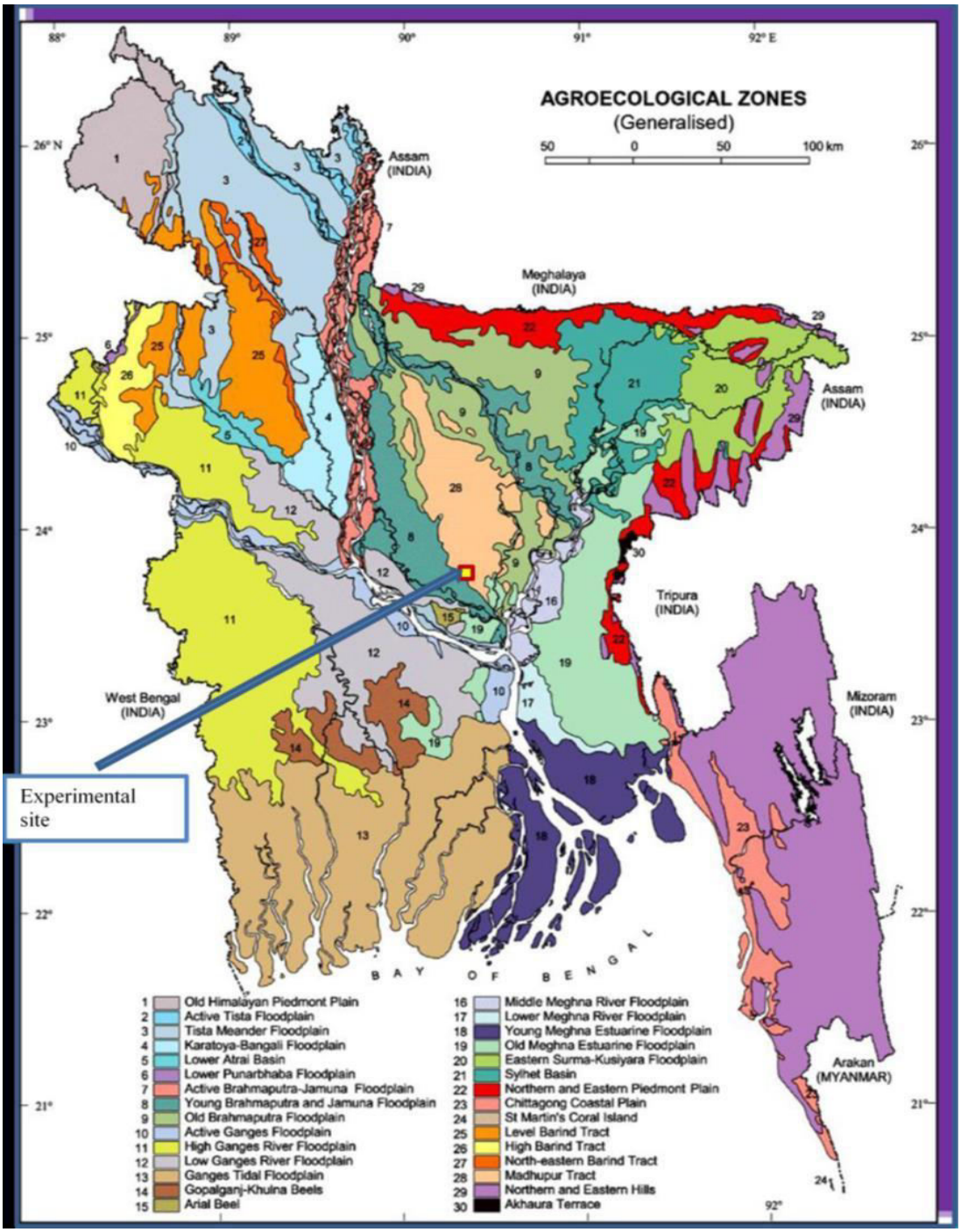
APPENDICES

Appendix I. Map showing the experimental site



Appendix II. Results of mechanical and chemical analysis of soil of the experimental plot

Morphological Characteristics

Morphological features	**characteristics**
Location	Horticulture Garden, SAU, Dhaka
AEZ	Modhupur Tract (28)
General Soil Type	Shallow red brown terrace soil
Land Type	Medium high land
Soil Series	Tejgaon
Topography	Fairly leveled
Flood Level	Above flood level
Drainage	Well drained

Mechanical analysis

Constituents	**Percent**
Sand	27
Silt	43
Clay	30

Chemical analysis

Soil properties	**Amount**
Soil pH	5.8
Organic carbon (%)	0.45
Total nitrogen (%)	0.03
Available P (ppm)	20
Exchangeable K (%)	0.1
Available S (ppm)	45

Source: Soil Resource Development Institute (SRDI)

Appendix III. Monthly record of annual temperature, rainfall, relative humidity, soil temperature and sunshine of the experimental site during the period from October 2019 to April 2020 (Site-Dhaka)

Year	Month	** Air temperature (^{0}C)			**Relative humidity (%)	*Rainfall (mm)	**Sunshine (Hours)
		Maximum	Minimum	Mean			
	October	30.60	24.2	27.40	75.87	04	206.9
	November	29.85	18.50	24.17	70.12	00	235.2
	December	26.76	16.72	21.74	70.63	00	190.5
2020	January	24.05	13.82	18.93	62.04	00	197.6
	February	28.90	18.03	23.46	68.79	09	220.5
	March	32.24	22.10	27.17	78.82	68.5	208.2
	April	36.3	25.4	30.85	59	155	248.9

Source: Bangladesh Meteorological Department (Climate & weather division) Agargoan, Dhaka, Bangladesh

** Monthly average

*Monthly total

Appendix IV: Analysis of variance of the data on plant height at different days after transplanting (DAT) of brinjal as influenced by different varieties and pruning treatments

Source of variation	Degree of freedom	Mean square			
		Plant height (cm)			
		30 DAT	45 DAT	60 DAT	70 DAT
Replication	2	0.069	2.411	0.582	17.591
Pruning (A)	3	60.792**	206.574**	207.360**	169.464**
Variety (B)	2	125.799**	580.194**	591.184**	347.904**
Interaction (AxB)	6	13.669**	2.127**	3.108**	7.192**
Error	22	1.004	0.688	2.199	2.236

** : Significant at 0.01 level of probability

* : Significant at 0.05 level of probability

NS : Non-significant

Appendix V: Analysis of variance of the data on number of leaves at different days after transplanting (DAT) of brinjal as influenced by different varieties and pruning treatments

Source of variation	Degree of freedom	Mean square			
		Number of leaves			
		30 DAT	45 DAT	60 DAT	70 DAT
Replication	2	0.0120	0.080	0.531	0.412
Pruning (A)	3	3.1968**	70.083**	45.290**	70.297**
Variety (B)	2	12.2574**	122.688**	120.490**	255.794**
Interaction (AxB)	6	0.5287**	2.427**	3.340**	0.706**
Error	22	0.1216	0.359	0.370	0.531

** : Significant at 0.01 level of probability

* : Significant at 0.05 level of probability

NS : Non-significant

Appendix VI: Analysis of variance of the data on number of branch at different days after transplanting (DAT) of brinjal as influenced by different varieties and pruning treatments

Source of variation	Degree of freedom	Mean square			
		Number of branch			
		30 DAT	45 DAT	60 DAT	70 DAT
Replication	2	0.11583	0.1408	0.1508	0.5330
Pruning (A)	3	0.84789**	10.6433**	9.5423**	8.8612**
Variety (B)	2	7.51518**	9.3925**	26.3669**	38.8680**
Interaction (AxB)	6	0.03114**	0.1358**	0.4035**	0.4352**
Error	22	0.11311	0.1181	0.2699	0.2136

Appendix VII: Analysis of variance of the data on days to 1st flowering, number of flower per plant, number of fruit per plant after transplanting of brinjal as influenced by different varieties and pruning treatments

Source of variation	Degree of freedom	Mean square		
		Days to first flowering	Number of flower per plant	Number of fruit per plant
Replication	2	0.0994	3.642	0.165
Pruning (A)	3	39.4167**	256.608**	151.047**
Variety (B)	2	42.9906**	750.639**	410.709**
Interaction (AxB)	6	0.9727**	20.066**	47.459**
Error	22	0.6500	1.372	0.351

** : Significant at 0.01 level of probability

* : Significant at 0.05 level of probability

NS : Non-significant

Appendix VIII: Analysis of variance of the data on fruit length, diameter, average fruit weight after transplanting of brinjal as influenced by different varieties and pruning treatments

Source of variation	Degree of freedom	Mean square		
		Fruit length (cm)	Fruit diameter (cm)	Average fruit weight (g)
Replication	2	2.107	0.35566	6.00
Pruning (A)	3	1.817^{NS}	0.70116^{NS}	23.84**
Variety (B)	2	198.382**	1.15743*	3310.90**
Interaction (AxB)	6	2.902**	0.54896^{NS}	0.34**
Error	22	1.816	0.20860	1.20

Appendix IX: Analysis of variance of the data on yield per plant, yield per plot and yield per hectare after transplanting of brinjal as influenced by different varieties and pruning treatments

Source of variation	Degree of freedom	Mean square		
		Yield/plant (kg)	Yield/plot (kg)	Yield/ha (ton)
Replication	2	0.00115	0.0935	0.891
Pruning (A)	3	0.08971**	7.2662**	69.217**
Variety (B)	2	0.74675**	60.4870**	576.199**
Interaction	6	0.00093**	0.0750**	0.714**
(AxB)	22	0.00153	0.1239	1.181

** : Significant at 0.01 level of probability

* : Significant at 0.05 level of probability

NS : Non-significant

Appendix X: Effect of pruning on yield per hectare of brinjal

Treatments	Yield (t/ha)
P_0	43.22 d
P_1	45.34 c
P_2	47.26 b
P_3	49.73 a
LSD	1.0623
CV %	2.34

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where P_0 = Control, P_1 = Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and lateral branch pruning

Appendix XI: Effect of variety on yield per hectare of brinjal

Treatments	Yield (t/ha)
V_1	52.83 a
V_2	39.06 c
V_3	47.28 b
LSD	0.9200
CV %	2.34

In a column, means with similar letter (s) are not significantly different and those having dissimilar letter (s) are significantly different by LSD at 5% level of significance where V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10

Appendix XII. Per hectare production cost of brinjal

A(1). Input cost

Treatment combination	Labour cost	Ploughing cost	Seed cost	Irrigation cost	Staking cost	Total (TK.) A(1)
P_0V_1	69850	40000	6000	24000	20000	159850
P_0V_2	69850	40000	6000	24000	20000	159850
P_0V_3	69850	40000	6000	24000	20000	159850
P_1V_1	76850	40000	6000	24000	20000	166850
P_1V_2	76850	40000	6000	24000	20000	166850
P_1V_3	76850	40000	6000	24000	20000	166850
P_2V_1	76850	40000	6000	24000	20000	166850
P_2V_2	76850	40000	6000	24000	20000	166850
P_2V_3	76850	40000	6000	24000	20000	166850
P_3V_1	77850	40000	6000	24000	20000	167850
P_3V_2	77850	40000	6000	24000	20000	167850
P_3V_3	77850	40000	6000	24000	20000	167850

Here, V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10, P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and Lateral branch pruning

Cost per labour = 400 tk

A(2). Input cost

Treatment combination	Manures and fertilizers					Pesticides and fungicides	Total Cost (TK.) A(2)	Total input (TK.) [A(1) + A(2)]
	Cowdung	Urea	Gypsum	TSP	MoP			
P_0V_1	20000	4800	2000	6250	2000	10000	45050	204900
P_0V_2	20000	4800	2000	6250	2000	10000	45050	204900
P_0V_3	20000	4800	2000	6250	2000	10000	45050	204900
P_1V_1	20000	4800	2000	6250	2000	10000	45050	211900
P_1V_2	20000	4800	2000	6250	2000	10000	45050	211900
P_1V_3	20000	4800	2000	6250	2000	10000	45050	211900
P_2V_1	20000	4800	2000	6250	2000	10000	45050	211900
P_2V_2	20000	4800	2000	6250	2000	10000	45050	211900
P_2V_3	20000	4800	2000	6250	2000	10000	45050	211900
P_3V_1	20000	4800	2000	6250	2000	10000	45050	212900
P_3V_2	20000	4800	2000	6250	2000	10000	45050	212900
P_3V_3	20000	4800	2000	6250	2000	10000	45050	212900

Here, V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10, P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and Lateral branch pruning

Cowdung = 2 Tk/Kg

Urea = 16 Tk/Kg

TSP = 30 Tk/Kg

MoP = 10 Tk/Kg

Zypum = 20 Tk/Kg

B. Overhead cost (Tk./ha)

Treatment combination	Cost of lease of land for 6 months (12% of value of land Tk. 15,00000/year	Miscellaneous cost (Tk. 5% of the input cost	Interest on running capital for 6 months (Tk. 12% of cost/year	Sub total (Tk) (B)	Total cost of production (Tk./ha) [Input cost (A)+ overhead cost (B)]
P_0V_1	90000	10245	9154	109399	314299
P_0V_2	90000	10245	9154	109399	314299
P_0V_3	90000	10245	9154	109399	314299
P_1V_1	90000	10595	9374	109969	321869
P_1V_2	90000	10595	9374	109969	321869
P_1V_3	90000	10595	9374	109969	321869
P_2V_1	90000	10595	9374	109969	321869
P_2V_2	90000	10595	9374	109969	321869
P_2V_3	90000	10595	9374	109969	321869
P_3V_1	90000	10645	9406	110051	322951
P_3V_2	90000	10645	9406	110051	322951
P_3V_3	90000	10645	9406	110051	322951

Here, V_1 = BARI Begun-4, V_2 = BARI Begun-7, V_3 = BARI Begun-10, P_0 = Control, P_1=Old leaf remove, P_2 = Lateral branch pruning, P_3 = Old leaf remove and Lateral branch pruning