Original Research Article

Study the Growth and Yield Performance of Tomato (*Lycopersicum esculentum* L.) at Different Building Height of Rooftop Gardening

ABSTRACT

Rooftop gardening is very important for food security and environmental restoration, but if it is not economically feasible on the basis of productivity than rooftop gardening will not increase and sustain. To know the productivity on different height of buildings roof, an experiment was conducted at the Agroforestry research field and the rooftop of different buildings at Sher-e-Bangla Agricultural University, Dhaka during the period from September, 2021 to march, 2022. The experiment was laid out in a Completely Randomized Design with four replications containing four pots in each replication. The plant material was BARI Tomato -14 and treatments of this experiment were T_1= Control (Ground level, 0.0 m), T_2= Rooftop of three storied building (11.28 m), T_3 = Rooftop of six storied building (21.34 m), T_4 = Rooftop of ten storied building (34.75 m). Different height of buildings rooftop showed significant effects on the air temperature, moisture of pot soil, growth, yield contributing characters and yield of tomato. The treatment T_1 showed significantly higher moisture content of pot soil, plant height, plant stem diameter, branch number per plant, leaf number per plant, flower cluster number per plant, fruit number per plant, fruit length, fruit diameter, individual fruit weight and yield per plant than all other treatments but T_4 showed significantly lowest results in all the above mentioned characters. T_1 showed significantly lowest result in case of air temperature but T_4 showed highest result. There was no significant effect on chlorophyll content of tomato leaf. All the moisture content of pot soil, growth except chlorophyll content of leaf, yield contributing characters and yield of tomato showed a gradually decreasing results with the increasing of buildings rooftop height. The sequence of moisture content of pot soil, growth except chlorophyll content of leaf, yield contributing characters and yield were T_1>T_2>T_3>T_4 but in case of air temperature, the sequence was T_4> T_3> T_2> T_1.

Keywords: Growth, Yield, Tomato, Building height, Rooftop gardening

1. INTRODUCTION

In the Meantime, Urbanization and Human Activities induced climate change impacts are two distinct hot topics that are worth discussion. Urbanization brings various challenges like greater ambient noises, increased environmental stressors and massive demand for food. 54% of the total world population is urbanized, the share is expected to reach up to 66% in less developed regions and 86% in most developed regions by 2050 (United Nations, 2014). Moreover, many urban residents are facing problems due to lack of space for vegetation. The problem of urbanization and destruction of fertile soils invites the solution of rooftop gardening. Where the lives of people are obstructed and there is a scarcity of soil and land to cultivate plants, Rooftop gardening is itself a prodigious idea for pitching a road towards sustainability. Some cities are trying to boost sustainability through urban farming as a possible solution to these problems (Nasr *et.al,* 2001). Now-a-days, a massive misuse of pesticide and degrading soil fertility, the fright of health hazards while consuming the market vegetables are inside the minds of people somewhere. Rooftop gardening may seem a small step but it is a leap ahead for sustainability and combating the havoc of climate change hazards. Microclimate can be modified by rooftop farming because of its contribution to mitigate the ecological problems and advancement of metropolitan food system. Rooftop garden regulates the temperature on the roof as well as the room below the roof garden (Gupta and Mehta, 2017). 60% of heat gain can be reduced by the vegetation of the green roof system. This result to decrease in temperature as compared to other buildings which lack the rooftop garden (Williams *et.al,* 2010).

Bangladesh is a developing country. Its economic growth is rapid and population growth also high. In Bangladesh, there are total 532 urban areas, which are divided into three categories. These are city corporation, municipal corporation (Pourasova) and upazila town. Among these urban areas, Dhaka is the largest city by population and area, with a population of 19.10 million (BBS, 2014). There are total 11 city corporations and 329 municipal corporations and 203 small towns in Bangladesh. According to 2011 population census, Bangladesh has an urban population of 28%, with a growth rate of 2.8% (BBS, 2014). At this growth rate, it is estimated that the urban population of Bangladesh will reach 79 million or 42% of total population by 2035.

With speedy and unplanned urbanization, incidence of city poverty and meals insecurity has been additionally growing alarmingly in Dhaka (Choguill, 1995). Islam *et al*., (2004) seen that urban agriculture (UA) contributes to meals protection by means of growing the furnish of meals and by means of improving the perishable meals attaining city consumers. There are economic, social and environmental opportunities of local and efficient food production through innovative urban rooftop farming (Sanyé-Mengual *et al*., 2015).

Bangladesh is one of the most densely populated countries in the world where 1015 persons are living per square kilometer (BBS, 2013). The per capita land area is decreasing at an alarming rate due to increasing population (Hossain and Bari, 1996).

The population is increasing and cultivable land is decreasing in Bangladesh. Though the home yard of the villages has some space for gardening but urban areas have lack enough space for gardening. So, it is very challenging to feed the people of urban arears in future. On the other hand, due to urbanization, rooftop of building appropriate for cultivation is increasing day by day. So, rooftop gardening is a great opportunity to face the challenge of food scarcity and climate change as well as biodiversity conservation.

Vegetables are one of the essential food items of daily requirement which can contribute in overcoming such health hazard. So, improvement of daily dietary value depends largely on the vegetable consumption. The per capita consumption of vegetables in Bangladesh is only 53 g, which is far behind the daily requirement of 200 g/head (Rashid, 1999). This figure is lower than that of some other Asian countries like India (167 g), Pakistan (69 g), Sri Lanka (120 g), China (280 g) and Japan (248 g); the world average consumption being 250 g/head/day (Rampal and Gill, 1990). So, vegetable production and consumption need to be increased in Bangladesh. Vegetables are not produced evenly throughout the year in Bangladesh. About 35% of the vegetables are produced in summer season and the rest in the winter season (Rashid, 1999).

Tomato (*Solanum lycopersicon* Mill.) is one of the most important edible and nutritious vegetable crops in Bangladesh. It is a member of solanaceae family. Tomato is a self crossing annual crop. Because of its well adaptability to broad range of soil and climate in Banglades, it is grown in all home garden and in the field condition also. It ranks next to potato and sweet potato in respect of vegetable production in the world. The cultivated area under tomato in Bangladesh is 6.81%, average yield 5451 kg/acre, total production 368000 tons. (BBS, 2016), which is very low compared to other countries like India (15.67 t/ha), China (30.39 t/ha), Egypt (34.00 t/ha), Turkey (41.77 t/ha), Japan (52.82 t/ha) and USA (65.22 t/ha) (FAO, 2008).

Tomato fruit is classified as a berry. As a true fruit, it develops from the ovary of the plant after fertilization, its flesh comprising the pericarp walls. It is a good source of vitamins (A and C) and minerals (Hobson and Davies, 1971; Kalloo, 1991). More than 7% of total vitamin-C of vegetable origin comes from tomato in Bangladesh (BBS. 2008).

In most cases, production of different crops in rooftop gardening depends on insect (for infestation or fertilization) as well as surrounding air temperature, moisture content of soil, humidity and air velocity etc. All these factor (insect, temperature, moisture, humidity, air velocity) may be different at different height of urban building. But in urban areas, height of buildings is not same. As a result, production of crops on rooftop may be affected at different height of building rooftop.

Among the potential vegetables, tomato is a very popular vegetable in Bangladesh. Unfortunately, this crop has not been studied on rooftop gardening at different height of buildings rooftop. Considering the above-mentioned facts, a popular tomato variety was selected in this study for evaluating the performance of growth and yield of tomato on different height of buildings rooftop.

The research work had the following objectives:

i. To evaluate temperature of air the and moisture of pot soil at different height of buildings rooftop.

ii. To evaluate the growth and yield contributing characters of tomato at different height of buildings rooftop.

iii. To identify the optimum height of building rooftop for tomato cultivation.

2. MATERIALS AND METHODS

i) **Location:** The experimental site was located between 23°74/N latitude and 90°35/E longitudes with an altitude of 8.2 m, Sher-e-Bangla Agricultural University, Bangladesh.

ii) **Plant materials:** Tomato (BARI Tomato -14)

ii. **Treatments:** The following four treatments were maintained in this study-

T_1 -control (ground) (0.0 m)

T_2-rooftop of three storied building (11.28 m)

T_3- rooftop of six storied building (21.34 m)

T_4- rooftop of ten storied building (34.75 m)

iii) Experimental design and layout

The experiment was laid out in a completely Randomized Design (CRD) with four replications on ground and different height of three buildings rooftop in plastic pot contained four pots in each replication and each pot contained 1 tomato plant.

iv) Uprooting and transplanting of seedlings

Seedlings of 35 days old on 22nd November, 2021 were uprooted separately from the seedbed and transplanted properly.

v) Intercultural operations

Intercultural operations were done whenever needed for better growth and development. Intercultural operations followed in the experiment were irrigation, weeding, staking, pest control etc.

vi) Harvesting

Harvesting was started during early ripe stage when the fruits attained slightly red color. Harvesting was done at 7 days' interval starting from 15th February, 2022 and was continued up to 15th March, 2022.

vii) Data collection and recording

Experimental data were recorded from 15 days after transplanting and continued until last harvest. The following data were recorded during the experimental period.

1. Temperature

The temperature of air was taken by the help of Thermometer at 30 DAT, 40 DAT, 50 DAT, 60 DAT at day (2.0 pm) and night (10.0 pm). The temperature was taken in degree Celsius (^{0}C).

2. Moisture of pot soil

The moisture content of the pot soil was taken consecutively 7 days from 45 DAT to 51 DAT by the help of Moisture meter at 4.0 pm and average moisture content was calculated. The moisture was taken in %.

3. Plant height

Plant height was measured in centimeter from the ground level to the tip of the highest leaf and means value was calculated. To observe the growth rate plant height was recorded at 15 DAT, 30 DAT, 45 DAT and 60 DAT (days after transplanting).

4. Plant stem diameter

Plant stem diameter was measured in centimeter by using Vernier caliper. Stem diameter was recorded at 15 DAT, 30 DAT, 45 DAT and 60 DAT.

5. Number of leaves per plant

Leaves number were counted from each plant at 15 DAT, 30 DAT, 45 DAT and 60 DAT.

6. Number of branches per plant

The total number of branches per plant were counted from each plant at 15 DAT, 30 DAT, 45 DAT and 60 DAT.

7. Chlorophyll Content

Chlorophyll content of the leaves of plant was measured by SPAD-meter. Unit of chlorophyll content was SPAD value.

8. Flower cluster number per plant

Total number of flower cluster per plant were counted and recorded

9. Number of fruits per plant

Total number of fruits per plant were counted and recorded.

10. Fruit length

The length of fruit was measured with a slide calipers from the neck of the fruit to the bottom of randomly selected 6 fruits in centimeter (cm) and calculated the average length of the fruit.

11. Fruit diameter

Diameter of fruit was measured at the middle portion of randomly selected 6 fruits from each plant with a slide calipers in centimeter (cm) and calculated the average diameter of the fruit.

12. Individual fruit weight

Total weight of fruit was measured from each plant from 1st to last harvest and individual fruit weight was measured divided with the number of fruits per plant. Individual fruit weight was recorded in gram (g).

13. Fruit yield per plant

Fruit yield per plant was calculated by totaling fruit yield from first to final harvest and was recorded in gram (g).

x) Statistical analysis

All the obtained data were subjected to compiled and analyzed by microsoft Excel Worksheet and Statistix 10 software.

3. RESULTS AND DISCUSSION

Results obtained from the study have been presented and discussed in this section with a view to evaluation the air temperature and soil moisture and then performance of tomato growth, yield contributing characters and yield on different height of buildings rooftop to compare with ground level. The data are given in different tables and figures. The results have been discussed, and possible interpretations are given under the following headings.

3.1 Air temperature

Figure 1 showed that, during day and night, there were significant differences of air temperature among T_1, T_2, T_3, T_4. The lowest temperature was found at T_1 and the highest temperature was found at T_4. T_3 showed higher temperature than T_2. The temperature was increased with the increased of building rooftop height. The sequence of day temperature was $T_4 > T_3 > T_2 > T_1$.

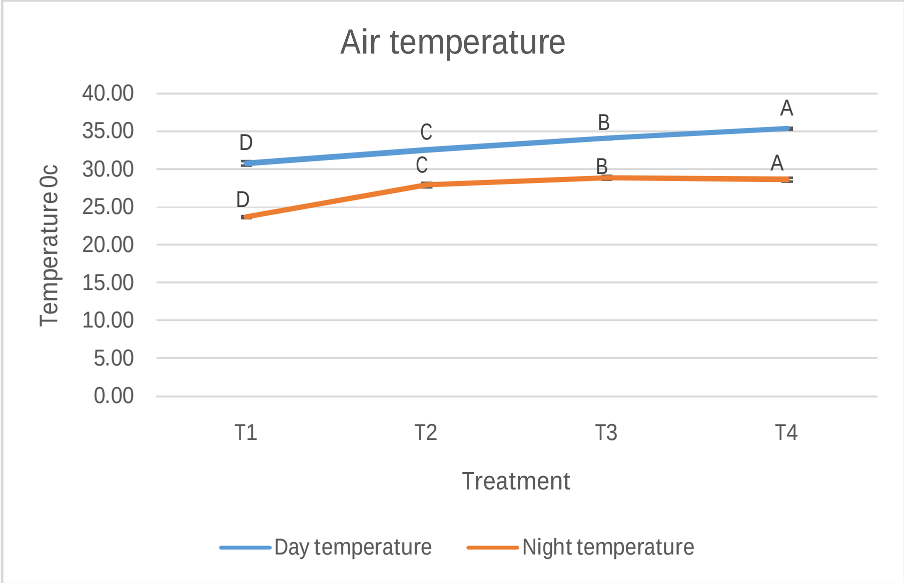

Figure 1. Day and Night temperature of air at different building height of rooftop gardening

3.2 Moisture content of pot soil

Moisture content of pot soil at T_1 showed higher than T_2, T_3 and T_4 but T_4 showed lowest moisture content. T_2 was statistically similar with T_3 but significantly higher than T_4. On the other hand, T_3 had statistically similar moisture content with T_4 (Figure 2)

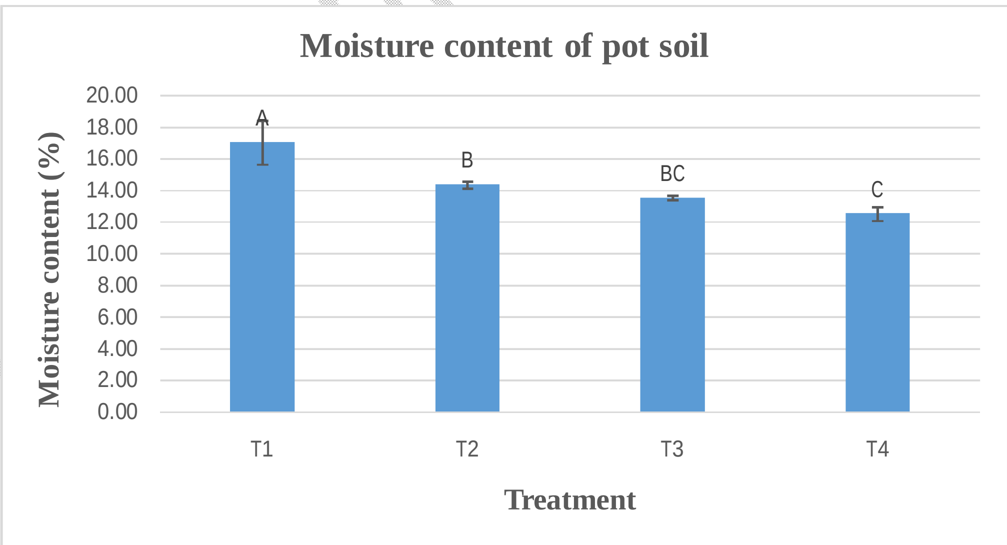

Figure 2. Moisture content of pot soil at different building height of rooftop gardening

3.3 Plant height

At 15 DAT, 30 DAT, 45 DAT and 60 DAT, the highest plant height was found in T_1. Plant height of T_1 was significantly higher than T_2, T_3 and T_4. The lowest plant height showed T_4 compared T_1, T_2, T_3. T_2 and T_3 were significantly higher than T_4 and T_2 was significantly higher than T_3 (Table 1). At 15 DAT, 30 DAT, 45 DAT and 60 DAT, plant height showed a decreasing sequence with the increasing of building rooftop height. The sequence of plant height was $T_1>T_2>T_3>T_4$ (Table 1). As building rooftop height increased, as well as air temperature increased but moisture content of pot soil decreased which adversely affected on plant height. High temperature condition strongly affected the vegetative organs and tissues of tomato plants for all cultivars (Abdelmageed *et al.*, 2003). Sibomana *et al.* (2013) revealed that, Severe water stress (40% of PC) reduced the plant height by 24% compared to the control.

Table 1. Plant height of tomato at different building height of rooftop gardening at different days after transplanting

Treatment	Plant Height (cm)			
	15 DAT	**30 DAT**	**45 DAT**	**60 DAT**
T_1	16.72 A	39.35 A	67.12 A	89.26 A
T_2	14.18 B	31.59 B	52.49 B	78.60 B
T_3	13.72 C	27.70 C	45.51 C	62.59 C
T_4	11.09 D	23.58 D	42.28 D	54.72 D
CV%	1.5	2.23	1.42	1.07
LSD (0.05)				

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

3.4 Plant stem diameter

At 15 DAT, 30 DAT, 45 DAT and 60 DAT, the highest plant stem diameter was found in T_1. Stem diameter of T_1 was significantly higher than T_2, T_3 and T_4. The lowest stem diameter was found in T_4.

At 15 DAT, 30 DAT, 45 DAT and 60 DAT, stem diameter showed a decreasing sequence with the increasing of building rooftop height. The sequence of stem diameter was $T_1 > T_2 > T_3 > T_4$ (Table 2). Increasing of building rooftop height, caused increasing of air temperature but decreasing of moisture content of pot soil occurred that causes decreased stem diameter of tomato plant stem. Sibomana *et al*. (2013) revealed that, Severe water stress (40% of PC) reduced the stem diameter by 18% compared to the control.

Table 2. Stem diameter of tomato at different building height of rooftop gardening at different days after transplanting

Treatment	Plant Diameter (cm)			
	15 DAT	**30 DAT**	**45 DAT**	**60 DAT**
T_1	0.66 A	1.01 A	1.26 A	1.47 A
T_2	0.51 B	0.78 B	1.00 B	1.20 B
T_3	0.46 C	0.71 C	0.94 C	1.02 C
T_4	0.41 D	0.66 D	0.84 D	0.94 D
CV%	1.81	1.10	1.60	1.60
LSD (0.05)				

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

3.5 Leaf number per plant

At 15 DAT, the highest leaf number per plant was found at T_1 which was significantly higher than all other treatments (T_2, T_3 and T_4) and the lowest leaf number per plant was found at T_4. The leaf number at T_2 (4.75) was statistically similar to T_3 (4.56) but higher than T_4 (Table 3).

Table 3. Leaf number per plant of tomato at different building height of rooftop gardening at different days after transplanting

Treatment	Leaf Number			
	15 DAT	**30 DAT**	**45 DAT**	**60 DAT**
T_1	5.63 A	25.88 A	33.13 A	49.66 A
T_2	4.75 B	18.69 B	28.81 B	39.06 B
T_3	4.56 B	15.78 C	23.68 C	34.73 C

T_4	4.00 C	11.48 D	20.84 D	29.63 D
CV%	5.23	4.45	2.8	2.64
LSD (0.05)				

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

At 30 DAT, 45 DAT and 60 DAT, the highest leaf number per plant was found at T_1 and the lowest leaf number per plant was found at T_4. The leaf number per plant of T_2 was higher than T_3. At 30 DAT, 45 DAT and 60 DAT, leaf number per plant showed a decreasing sequence with the increasing of building rooftop height. The sequence of leaf number per plant was $T_1 > T_2 > T_3 > T_4$ at 30 DAT (Table 3). High air temperature and low soil moisture occurred due to increased building rooftop height and tomato leaf number decreased. Soil moisture affected the vegetative growth stage of tomato (Liu *et al.*, 2019). Sibomana *et al.* (2013) revealed that, water stress resulted in significant decreases in vegetative growth.

3.6 Branch number per plant

At 30 DAT, the highest branch number per plant was found at T_1 which was significantly higher than T_3 and T_4 but T_1 was statistically similar with T_2. The branch number per plant of T_2 and T_3 were found 6.38 and 5.88 respectively which were statistically similar but higher than T_4 (Table 4). The lowest branch number per plant was found at T_4 which was 4.81.

Table 4. Branch number per plant of tomato at different building height of rooftop gardening at different days after transplanting

Treatment	**Branch Number**		
	30 DAT	**45 DAT**	**60 DAT**
T_1	7.13 A	9.81 A	11.00 A
T_2	6.38 AB	7.94 B	9.50 B
T_3	5.88 B	7.13 C	8.81 C
T_4	4.81 C	6.63 C	7.25 D
CV%	6.51	4.81	3.42
LSD (0.05)			

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

At 45 DAT, the highest branch number per plant was found at T_1 (9.81) which was significantly higher than T_2, T_3 and T_4. The lowest branch number per plant was found at T_4 (6.63). The branch number per plant of T_3 and T_4 were 7.13 and 6.63 respectively which were statistically similar. Branch number per plant at T_2 was statistically higher than T_3 and T_4 (table 4).

At 60 DAT, the highest branch number per plant was found at T_1 which was significantly higher than T_2, T_3 and T_4. The lowest branch number per plant was found at T_4. T_2 produced higher branch per plant than then T_3 and T_4. At 60 DAT, branch number per plant showed a decreasing sequence with the increasing of building rooftop height. The sequence of branch number per plant was $T_1>T_2>T_3>T_4$ at 60 DAT (Table 4). High air temperature and low moisture content of pot soil occurred due to increased building rooftop height that affected the branch number of tomato plant. Abdalla and Verkerk (1968), Abdul-Baki (1991), Peet *et al*. 1997) and El Ahamdi and Stevens (1979) revealed the adverse effect of high temperature on the vegetative development in tomato plants.

3.7 Chlorophyll content of tomato leaf

There was no significant difference among these treatments (T_1, T_2, T_3 and T_4) for SPAD value of tomato leaf (Figure 3).

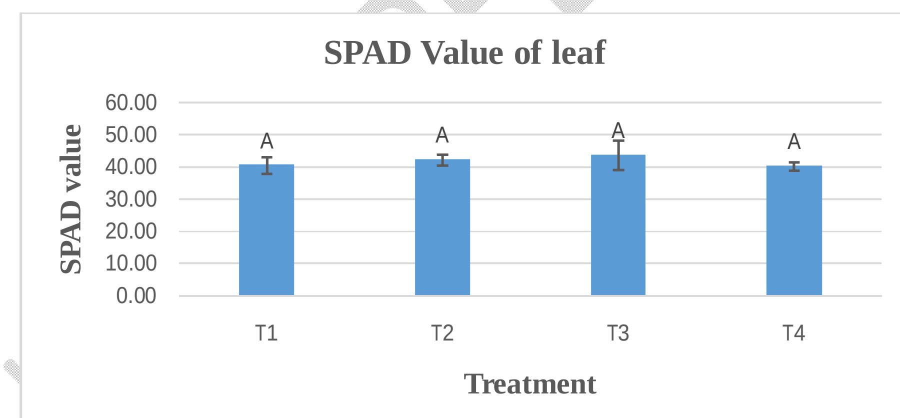

Figure 3. SPAD value of tomato at different building height of rooftop gardening

3.8 Number of flower cluster per plant

Figure 4 revealed that, the highest number for flower cluster per plant was found in T_1 and the lowest number of flower cluster per plant was found in T_4. T_2 produced statistically similar number of flower cluster per plant with T_3 but significantly higher than T_4. High air temperature and low soil moisture also affected on reproductive organs like number of flower cluster per plant and high air temperature and low moisture content of soil occurred due to building rooftop height increased. High temperature condition strongly affected the reproductive organs and tissues of tomato plants for all cultivars (Abdelmageed *et al*., 2003). Tomato was effected by soil moisture during flower setting stage (Liu *et* al., 2019). Tomato plants drop flowers when exposed to several days of daytime temperature above 29 °C and nighttime temperature above 21 °C (Ibukun and kelly*,* 2020). Abdalla and Verkerk (1968), Abdul-Baki (1991), Peet *et al.* 1997) and El Ahamdi and Stevens (1979) revealed the adverse effect of high temperature on the reproductive development in tomato plants and under a high temperature condition leading to flower drop.

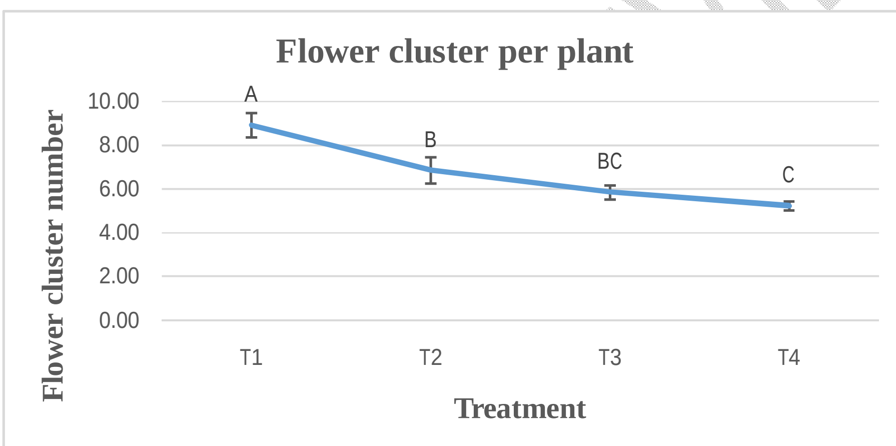

Figure 4. Flower cluster number per plant of tomato at different building height of rooftop gardening

3.9 Number of fruits per plant

For number of fruits per plant, T_1 was statistically higher than T_2, T_3 and T_4 and T_4 was significantly lower than all other treatments. T_2 produced higher fruit per plant than T_3 and T_3 produced higher fruit per plant than T_4. Fruit number per plant showed a decreasing result with the increasing of building rooftop height. The sequence of fruit number per plant was T_1>T_2>T_3>T_4 (figure 5). High air temperature and low soil moisture occurred due to increase building rooftop height that adversely affected on number of fruits per plants The soil moisture content lower than 65% of filed capacity also decreased the fruit number (Hao *et al.*, 2009). Tomato was effected by soil moisture during fruit setting stage (Liu *et al.*, 2019). Abdalla and Verkerk (1968), Abdul-Baki (1991), Peet *et al.* 1997) and

El Ahamdi and Stevens (1979) revealed the adverse effect of high temperature on the reproductive development in tomato plants and under a high temperature condition, the fertility rate of tomato flowers is greatly reduced and reduced fruit setting.

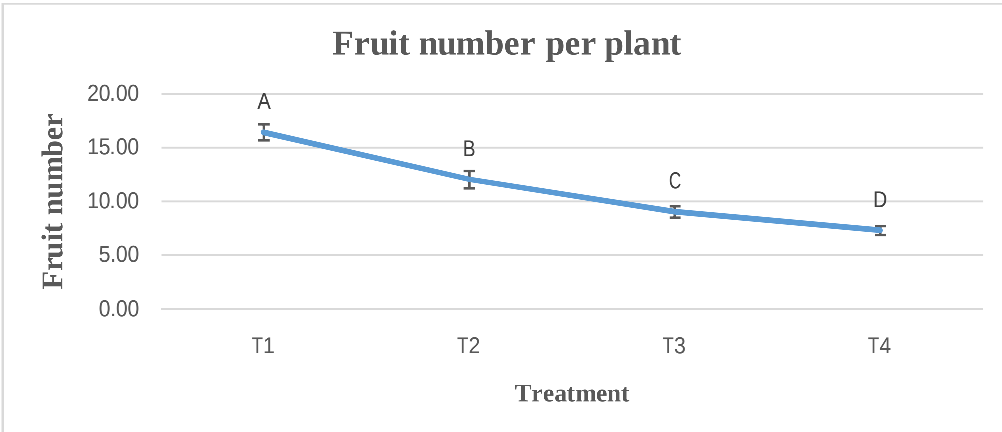

Figure 5. Fruit number per plant of tomato at different building height of rooftop gardening

3.10 Individual fruit length

The highest fruit length was found at T_1 which was statistically higher than T_2, T_3 and T_4. The lowest fruit length was found at T_4. T_2 was higher than T_3. But fruit length at T_3 and T_4 was statistically similar (figure 6).

Figure 6. Individual fruit length of tomato at different building height of rooftop gardening

3.11 Individual fruit diameter

The highest fruit diameter was found at T_1 and the lowest fruit diameter was found at T_4. Fruit diameter showed at T_1 was higher than T_2, T_3 and T_4. T_2 was statistically higher than T_3. Fruit diameter at T_3 and T_4 showed statistically similar result (figure 7).

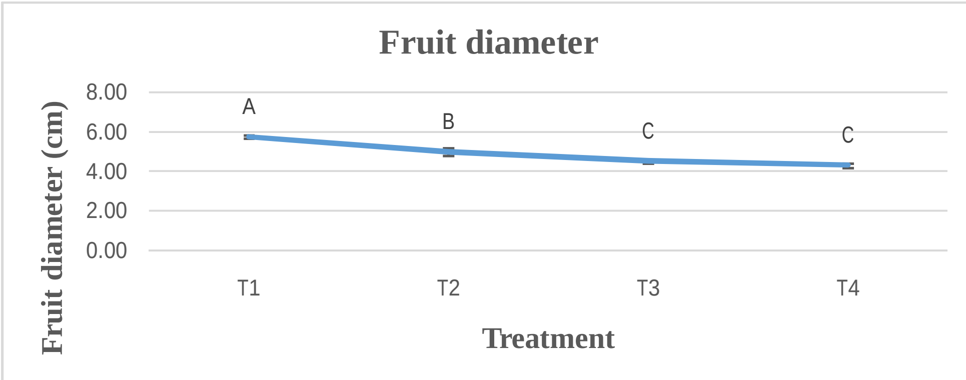

Figure 7. Individual fruit diameter of tomato at different building height of rooftop gardening

3.12 Individual fruit weight

Table 5 showed that, the highest individual fruit weight was found at T_1 which was 98.32 g and the lowest individual fruit weight was found at T_4 which was 52.61 g. Individual Fruit weight at T_2 and T_3 was 80.65 g and 64.23 g respectively in which T_2 was statistically higher than T_3. Individual fruit weight showed a decreasing result with the increasing of building rooftop height. The sequence of individual fruit weight was $T_1>T_2>T_3>T_4$. As building rooftop height increased, as well as air temperature increased but moisture content of pot soil decreased which adversely affected on individual fruit weight. Elevating the temperature often increases the fruit growth rate, but it has a greater effect in hastening maturity and, as a result, the final mean weight of tomato fruits is reduced (Hurd *et al*., 1985). Tomato yield as effected by soil moisture during fruit development stage (Liu *et al*., 2019).

Table 5. Individual fruit weight and yield of tomato per plant at different building height of rooftop gardening

Treatment	Individual Fruit Weight (g)	Total Fruit Yield per Plant (g)
T_1	98.32 A	1664.9 A
T_2	80.65 B	992.31 B
T_3	64.23 C	612.89 C

T_4	52.62 D	401.24 D
CV%	2.21	2.20
LSD (0.05)		

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

3.13 Total fruit yield per plant

Highest fruit yield per plant was found at T_1 which was significantly higher than T_2, T_3 and T_4. Total fruit yield per plant showed significant differences among T_1, T_2, T_3 and T_4. The highest fruit yield per plant was found at T_1 which was 1664.9 g and the lowest fruit yield was found at T_4 which was 401.24 g. T_2 produced significantly higher fruit yield per plant than T_3. The yield of T_2 and T_3 was found 992.31g and 612.89 g respectively. Fruit yield per plant showed a decreasing result with the increasing of building rooftop height. The sequence of fruit yield per plant was $T_1>T_2>T_3>T_4$ (table 5). High air temperature and low soil moisture also affected on reproductive organs that affect the yield of tomato and high air temperature and low moisture content of soil occurred due to building rooftop height increased. High temperatures affect several physiological and biochemical processes dealing finally with yield reduction (Dinar and Rudich, 1985). The soil moisture content lower than 65% of filed capacity also decreased the yield (Hao *et al*., 2009). Tomato yield as effected by soil moisture during fruit maturity stage (Liu *et* al., 2019). Tomato reproduction is severely affected at day temperatures above 35 °C. As a result, tomato yield decreased by 52% to 85% at high air temperatures (Ibukun and kelly, 2020).

4. CONCLUSION

Different height of building rooftop showed significant effect on vegetative growth of tomato, temperature of air at day and night, moisture content of pot soil, yield contributing characters and yield of tomato. The treatment T_1 showed significantly higher plant height, plant stem diameter, branch number per plant, leaf number per plant, flower cluster number per plant, fruit number per plant, fruit length, fruit diameter, individual fruit weight and yield per plant than all other treatments but T_4 showed significantly lowest result in all the above mentioned characters. T_1 showed lowest result in case of temperature of air at day and night but T_4 showed highest result. In case of moisture content of pot soil, T_1 showed highest but T_4 showed lowest result. There was no significant effect on chlorophyll content of leaf of tomato. All the growth, yield and yield contributing characters except chlorophyll content showed a gradually decreasing results with the increasing of height of building rooftop. The sequence of growth, moisture content of pot soil, yield contributing characters and yield was T_1>T_2>T_3>T_4 but in case of temperature, the sequence was T_4> T_3> T_2> T_1.

Tomato plant produced higher growth and yield in T_1 (Ground level) than T_2, T_3 and T_4 treatment. So it is concluded that, T_1 treatment showed optimum performance in case of vegetative growth and maximum yield of tomato than the other treatment. But among buildings rooftop, T_2 (three storied building rooftop) showed highest performance in growth, yield and yield contributing characters except chlorophyll content. As gradually increased the height of building rooftop, sequentially decreased the growth, yield and yield contributing characters except chlorophyll content of leaf.

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