IMPACT OF ORGANIC AND INORGANIC FERTILIZERS ON VEGETATIVE GROWTH OF TOMATO (*Lycopersicum esculentum* Mill.)

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Abstract

The experiment of this study was conducted in 2019, at Botany Department, Dagon University, Rangon Region. The impact of inorganic and organic fertilizers was studied on the vegetative growth of Tomato (*Lycopersicum esculentum* Mill.). In this experiment, three treatments and four replications were arranged in Completed Randomized Design (CRD). Two months old of tomato seedling plants were placed to prepare polyethylene bags. In this experiment, three treatments are control (Normal soil), soil with10g NPK bag^{-1} and soil with10g chicken manure bag^{-1} are applied according to the layout. Each treatment had four replications and each bag containing one plant. In fertilizer treatments, the chicken manure treatment plants possessed the maximum number of plant height, number of leaves, number of branches, leaf length, leaf width and leaf area than other treated plants NPK and control. It was therefore concluded that the chicken manure was suitable for cultivation of *Lycopersicum esculentum* Mill.

Keywords: seedling plants, normal soil, chicken manure

INTRODUCTION

Tomato (*Lycopersicum esculentum* Mill.) which belongs to the family Solanaceae is one of the three important annual fruit vegetables of the tropical region which originated in South and Central America (Jule, 2001). The solanaceae consists of about 98 genera and some 2700 species with a great diversity of habitats, morphology and ecology (Griffin and Lin, 2002).

The habit of *Lycopersicum esculentum* Mill. is herb, herbaceous, serial branches covered with dense epidermal hairs. Leaves; alternate, pinnately compound, nearly entire leaf-lets. Inflorescence; short raceme. Flowers; pedicellate, bisexual, small-yellow, hypogynous. Fruit fleshy, many seeded berry, furrowed on the sides (Jagatheeswari, 2014).

Lycopersicum esculentum Mill. is considered a significance vegetable crop that plays a notable role in human health due to variety of vitamin, mineral and antioxidants such as lycopene (Adekiya and Agbede. 2015.).

Generally, the production of agricultural crop depends on many factors which can improve the soil fertility and this is through the application of organic and inorganic fertilizers. The need to use renewable forms of energy and reduce costs of fertilizing crops has revived the use of organic fertilizers worldwide (Ayoola and Adeniyan, 2006).

Animal manure has been used for plant production effectively for centuries. Large quantities of organic wastes such as poultry manure are available especially in urban source of nutrients for vegetables such as tomato (Adediran et al., 2003).

Application of chemical fertilizers in the crop field contributes greatly to the deterioration of the environment, loss of soil fertility, less agricultural productivity and soil degradation. Compared to inorganic fertilizer, organic manure is readily available to the farmers and the price is also low. Vegetable crops grown under organic conditions play an important role in the global economy (Inbar *et al*., 1993).

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MATERIAL AND METHODS

The experiment was conducted in 2019, at Department of Botany, University of Dagon. The seeds were collected from Vegetables and fruits Research Development Centre (VFRDC) in Ye Mon, Hlegu Township, Yangon Region, Myanmar.

Soil sample collection and analysis

The soil of the growing area was mixed with ash and sand in a ratio of 1:1. After soil preparation, the soil sample was collected for soil analysis. The physical and chemical characteristics of collected soil sample were analyzed in the soil laboratory, Land use Department, Myanmar Agricultural Services, Yangon Region.

Cultural Practices

After eight weeks, the seedling plants of *Lycopersicum esculetum* Mill. were transplanted to the prepare field. Each bag contains one plant. Three treatments such as control, 10g NPK bag-1 and 10g chicken manure bag -1 are applied according to the layout. Each treatment had four replications. Daily water supply and proper weeding was performed in this experiment.

Data Collection

Vegetative characters such as leaf length, leaf width, number of leaves, number of branches and plant height. In Reproductive characters such as number of buds and number of flowers were collected in this experiment.

The collected data were analyzed by IRRISTAT software, developed by International Rice Research Institute (IRRI), the Philippines.

RESULT

Soil analysis

The analyzed soil result expressed that the soil moisture of chicken (40.959%) manure was high, and also higher nitrogen (0.175%) and potassium (0.396%) than normal and NPK (Table.1).

Table 1. Experiment soil results for the *Lycopersicum esculentum* Mill

No.	Sample	Moisture %	Total N %	Total P_2O_5 %	Total K_2O %	pH
1.	Normal	30.599	0.07	0.125	0.11	8.86
2.	NPK (inorganic)	33.754	0.125	0.308	0.316	5.36
3.	Chicken Manure (inorganic)	40.959	0.175	0.264	0.396	8.40

Table 2. Comparison of plant height of *Lycopersicum esculentum* Mill.

Treatment	7DAT	14DAT	21DAT	28DAT	35DAT	42DAT	Average
T_1	5.00	6.59	9.41	12.71	19.63	28.39	13.62
T_2	4.14	7.18	12.45	19.41	30.47	44.88	19.77
T_3	4.70	7.97	14.26	22.15	33.55	50.47	22.22
F-test	ns	ns	ns	ns	*	ns	-
5% LSD	1.14	1.92	3.74	5.40	7.47	14.17	-
CV%	29.8	31.9	37.3	35.8	32.2	41.3	-

ns = non-significant * = significant DAT = days after treatment

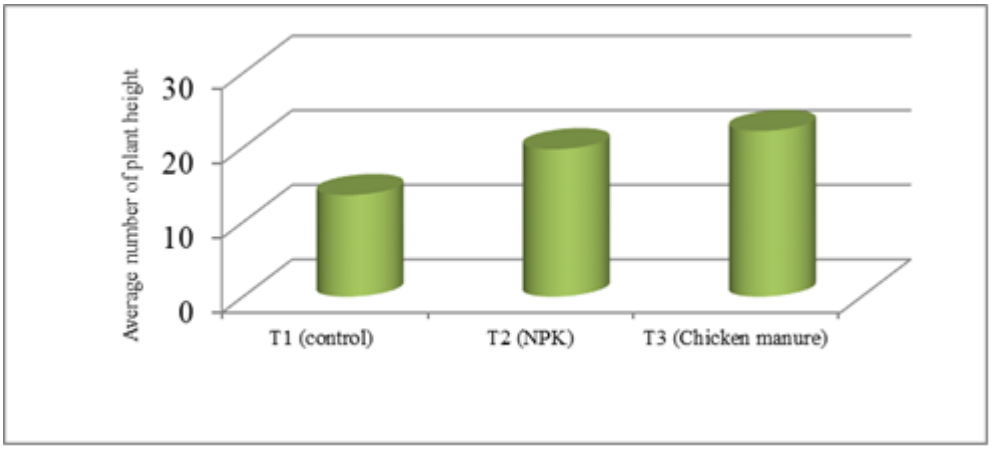

Figure 1. Plant height of *Lycopersicum esculentun* Mill.

The results of T_3 (chicken manure) treated plants showed that maximum plant height (22.22) and followed by T_2 (NPK) treated plants (19.77) and the control treated plants T_1 (13.62) . The chicken manure treated plants possessed the medium number of plant height (Table 2 and Figure 1).

Table. 3 Comparison of Number of branches *Lycopersicumesculentun* Mill.

Treatment	7DAT	14DAT	21DAT	28DAT	35DAT	42DAT	Average
T_1	3.54	5.45	7.45	8.54	10.8	12	7.96
T_2	4.54	6.12	7.16	8.7	10.8	11.6	8.15
T_3	4.16	5.7	7.37	8.79	11.3	12.6	8.32
F-test	ns	ns	ns	ns	ns	ns	-
5% LSD	0.76	0.72	2	1.76	2.44	3.14	-
CV%	22.4	15.1	32.9	24.4	26.8	31.3	-

ns = non-significant * = significant DAT = days after treatment

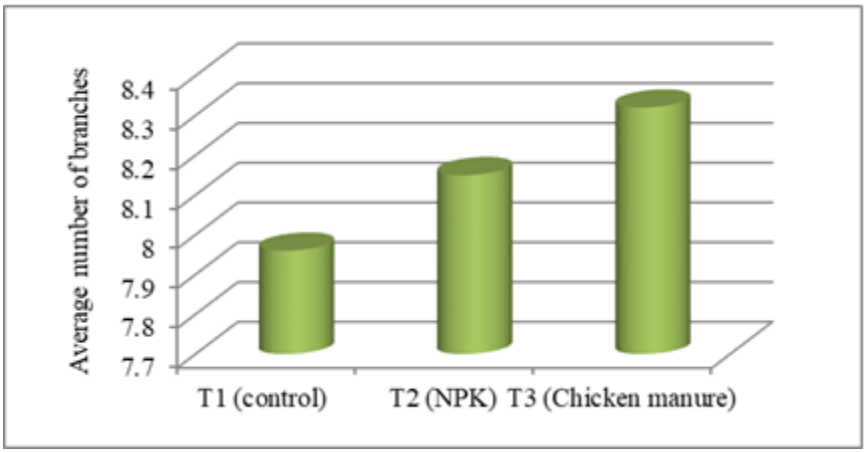

Figure 2. Number of branches *Lycopersicum esculentun* Mill.

The results of T_3 (chicken manure) treated plants possessed highest number of branches (8.32) and followed by were T_2 (NPK) (8.15) and followed by T_1 (control) (7.96) . T_3 treated plants were higher in branches than other treatments observed from this experiments (Table 3 and Figure 2).

Table 4. Comparison of number of leaves *Lycopersicum esculentun* Mill

Treatment	7DAT	14 DAT	21DAT	28DAT	35DAT	42DAT	Average
T_1	10.41	16.87	22.58	25.44	40.37	53.12	28.13
T_2	12.95	19.95	27.1	42.04	64.04	86.00	42.02
T_3	11.75	18.37	29.83	43.08	65.37	91.95	43.34
F-test	ns	ns	ns	*	*	*	-
5% LSD	2.09	3.03	6.17	8.06	15	22.11	-
CV%	21.5	19.8	28	26.3	31.8	34.5	-

ns = non-significant * = significant DAT = days after treatment

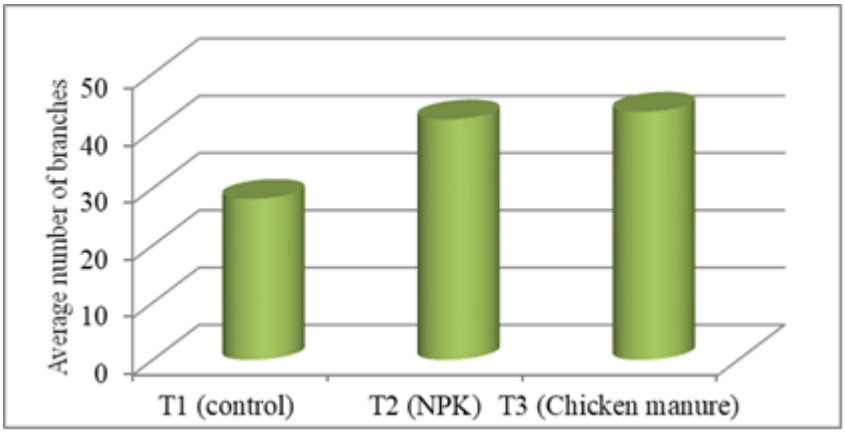

Figure 3. Comparison of number of leaves *Lycopersicum esculentun* Mill.

The results of T_3 (chicken manure) treated plants possessed highest of number of leaves (43.34) and followed by were T_2 (NPK) (42.02) and followed by T_1 (control) (28.13). T_3 chicken manure treatment was significantly greater than the control. (Table 4 and Figure 3).

Table 5. Comparison of leaves width of *Lycopersicum esculentun*Mill

Treatment	7DAT	14 DAT	21DAT	28DAT	35DAT	42DAT	Average
T_1	1.24	1.36	1.40	1.45	1.50	1.54	1.41
T_2	1.36	1.48	1.57	1.65	1.79	1.84	1.61
T_3	1.50	1.72	1.82	1.91	1.99	2.04	1.83
F-test	ns	ns	ns	ns	ns	ns	-
5% LSD	0.24	0.24	0.27	0.33	0.33	0.34	-
CV%	21.2	19.2	20.2	23.6	22.3	22.5	-

ns = non-significant * = significant DAT = days after treatment

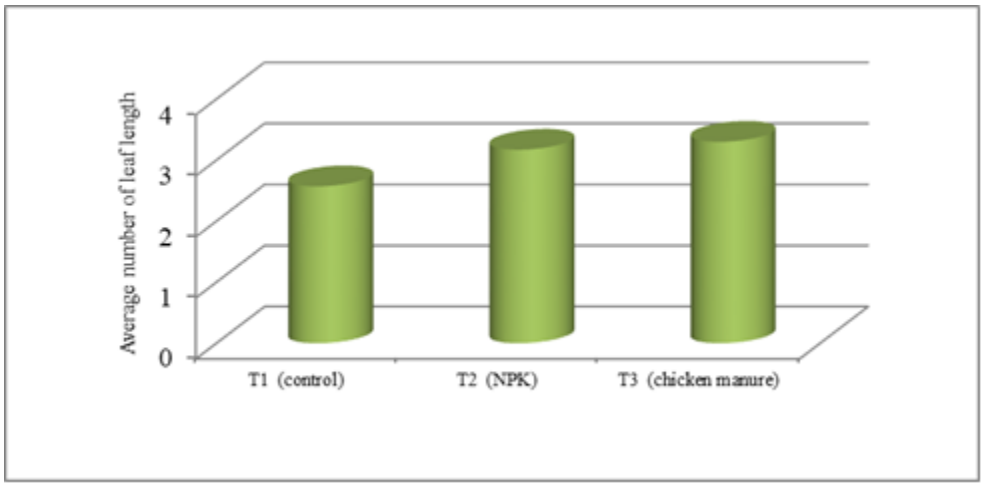

Figure 4. Comparison of number of leaves width *Lycopersicum esculentun* Mill.

The result showed that the leaf width of *Lycopersicum esculetum* Mill. were not significant on weekly treatments. The leaf width of T3 (chicken manure) were (1.83), T2 (NPK) (1.61) and then T1 (control) (1.41). The leaf width of T3 treated plants was higher than other treatments (table 5 and figure 4.)

Table 6. Comparison of leaf length of of *lycopersicum esculentum*

Treatment	7DAT	14 DAT	21DAT	28DAT	35DAT	42DAT	Average
T_1	1.96	2.33	2.60	2.75	2.87	2.93	2.57
T_2	2.39	2.95	3.20	3.39	3.45	3.64	3.17
T_3	2.59	3.09	3.29	3.42	3.75	3.88	3.30
F-test	ns	ns	ns	ns	ns	*	-
5% LSD	0.52	0.65	0.57	0.56	0.54	0.53	-
CV%	27.1	28.0	22.6	20.8	19.1	18.1	-

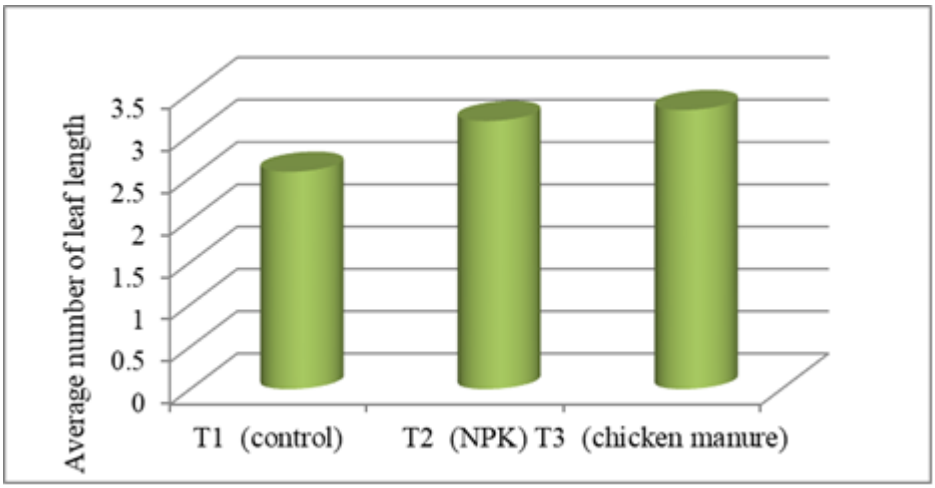

Figure 5. Comparison of leaves length of *Lycopersicum esculentun* Mill.

The result also showed that the highest leaf length (3.30 cm) was recorded for *Lycopersicum esculentum* Mill. which were treated with chicken manure and the

lowest leaf length (2.57) was recorded for control .The leaf length T2 treated plants was 3.17 (Table 6 and figure 5).

Table. 7 Comparison of Fertilizer affected on leaf area of *ycopersicumesculentum* Mill.

Treatment	Leaf Area
T_1 (Control)	6.02
T_2 (NPK)	8.85
T_3 (Chicken manure)	10.2
F-test	*
5%LSD	1.64
CV%	23.5

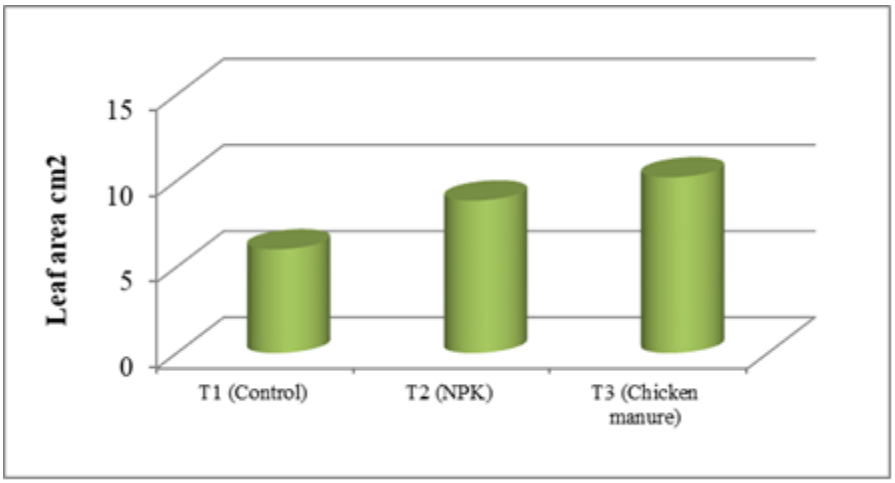

Figure 6. Comparison of leaves area of *Lycopersicum esculentun* Mill.

The results of T_3 (organic manure) treated plants showed that maximum of leaf area (10.2) and followed by T_2 treated plant (8.85). The control plants (6.02) were smaller than T_3 treated plants and T_2 treated plants were observed from this experiments. T3 chicken manure treated plants were significantly greater than the other treated plants (Table 7 and Figure 6).

DISCUSSION AND CONCLUSION

The result of the vegetative growth response to the fertilizer revealed that chicken manure treated plants produced higher in the plant height, number of branches, number of leaf, leaf width, leaf length and leaf area and also maximum number of flowers. The results of T_3 (chicken manure) treated plants showed that maximum plant height (22.22) and followed by T_2 (NPK fertilizer) treated plants (19.77) and the control treated plants T_1 (13.62).

The result showed significant differences in growth amongst treatments. The highest plants and highest leaf number were obtained from tomato provided with chicken manure. The lowest plant height and leaf number were obtained from tomato supplied with inorganic fertilizer (Michael et al., 2012).

Peter Keating (2005) pointed out chicken manure (organic fertilizer) provides reliable means of supplying vegetable crops with nutrients, particularly nitrogen and potassium. Inorganic fertilizers can result in negative effects such as leaching, pollution of water resources, destruction of micro-organisms and friendly insects, crop susceptibility to disease attack, acidification of the soil or reduction in soil fertility thus causing irreparable damage to the overall system.

In conclusion, it is recommended that its advantage is balanced nutrient management for the growth of *Lycopersicum esculentum* Mill. in applied fertilizers. Growth of tomato was significantly higher than the unfertilized plants.

Organic fertilizer (chicken manure) treated plants are responsible for the growth of *Lycopersicum esculentum* Mill. It is therefore recommended the application of chicken manure is good for *Lycopersicum esculentum* Mill (tomato).

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