

Study of Growth Rate on *Allium cepa* L. By Using Animal Manures

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Abstract

In this research, the effective results of growth rate and yield production between Kyaing Tong University, Department of Botany and the No (4), Pack Transport Battalion by using animal manures used the various ratio (Control, 19:1, 39:1) on *Allium cepa* L. (Kyet-thun-ni). The results of *Allium cepa* L., plant height, leaves number, leaves area: in factor A, among the three different animal manures, the tallest plant height was found by T₁ (19:1) in (mule); leaves number: in factor A, the tallest leaves number was found by T₁ (19:1) in (mule); leaves area: in factor A, the tallest leaves area (width) was found by T₁ (19:1) in (mule) and (length) was found by T₁ (19:1) in (mule). In factor B, the comparison of the three different animal manures, the tallest plant height was obtained in T₂ (39:1) in (mule); in factor B, the tallest leaves number was obtained in T₂ (39:1) in (donkey); in factor B, the tallest leaves area width was obtained in T₂ (39:1) in (mule) and the tallest length was obtained in T₂ (39:1) in (mule).

Key Words: Growth Rate, *Allium cepa* L.

Introduction

The present study was conducted to evaluate the effect of (Animal Manures) Horse Manure (HM), Donkey Manure (DM), Mule Manure (MM) on the growth rate of *Allium cepa* L. belongs to the family Amaryllidaceae (Kyet-thun-ni).

Manures and fertilizers to get high yields, various plant need to be fertilized. Two kinds of crop nutrients are chemical fertilizers and organic manures. Three types of organic manures are poultry manure, compost manure and farmyard manures. The most common kinds of farmyard manures are pig, horse and cow manure. Among these three kinds, horse manure nutrient is the best. Cow manure has relatively little phosphate. Pig manure is rich in the mineral salts. Manure from goat and sheep is good organic manures (Shankara *et al.*, 2005).

Fertilizer, synthetic or natural chemical substance or the mixture applied to enrich soil so as to raise plant growth. Organic fertilizers are fertilizers that are naturally produced and contain carbon (Christians *et al.*, 2016).

Horticulture means the branch of agriculture concerned with the intensively cultivated plants directly used by man for food, aesthetic purposes or medicinal purposes. Horticulture crops can be used in living state while others like grains etc. are not used in a living state (Gorashi, 1988).

Botanical systematics and history Onion (*Allium cepa* L.) are a member of the Alliaceae family and belongs to the genus *Allium* which consists of about 450 species. *Allium* plants are widely distributed over America, Asia, Europe and they have been

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used for millennia as vegetables, spices and for the treatment of other diseases (Lanzotti, 2006).

Onion (*Allium cepa* L.) is the most important member of the Amaryllidaceae family and one of the most important vegetables in the world. Onion bulb has a rich source of vitamin C, phosphorus, protein, calcium and carbohydrates possess a good medicinal property (Ramesh *et al.*, 2017).

Onion (*Allium cepa* L.) has valued as a medicinal plant and a food. It is a vegetable bulb crop known and is widely cultivated and consumed the worldwide (FAO, 2012). Onion is a short duration horticultural crop grown in lowest latitudes (Brewster, 1990). Onion is known as “Queen of the kitchen,” due to its valued aroma, unique taste, flavor and the medicinal properties of its compounds (Selvaraj, 1976; Griffiths *et al.*, 2002).

Many factors can affect the growth rate of vegetable crops, especially organic manures. The main objective of our study was to investigate growth rate of the most commonly found crop plants of No (4), Pack Transport Battalion, Kyaing Tong Township, Eastern Shan State.

Materials and Methods

Preparation for animal manures

Horse/ Donkey/ Mule’s Faeces (1Kg) mixed with Horse/ Donkey/ Mule’s Urine (1L), Lauk-thay leaves (75g), Ta-mar leaves (75g), Sa-ba-lin leaves (75g), Tobacco (30g), palm sugar (250g) and water (10L) which stirred with rod stick twice per day. After four days, fertilizers were made the various ratio for dilute concentration (19:1 and 39:1) and then Animal manures were thrown to the various plants.

Data collection

The following data were collected at weekly intervals. Plant height, number of leaves, leaves area (width and length) was collected (Umar *et al.*, 2019).

Experimental design

The field experiment was conducted using two factor-factorial design in Randomized Complete Block Design (RCBD) with three replications. Factor A was assigned as three different animal manures such as (horse), (donkey) and (mule) ratio T₁ (19:1) and Factor B was assigned as three different animal manures such as (horse), (donkey) and (mule) ratio T₂ (39:1). Each replicate included three plants and each treatment consisted of 9 plants. Row to row distance was 80 cm and plant to plant 20 cm.

Results

Scientific Name	- <i>Allium cepa</i> L.
Family Name	- Amaryllidaceae
Vernacular Name	- Kyet-thun-ni
English Name	- Onion

Plants autotrophic, with green leaves. Plants bulbiferous with roots thin; leaves without distinct midvein; scape terete or several angled. Inflorescence an umbel, at first wholly enveloped by a scarious spathe. Leaves usually thick, terete, fistulose, smooth. Style 1, simple to 3-fid; anthers not reniform, with 2 separate locules; ovules

2 to several per locule. Bulb solitary, globose, ovoid-globose, or ovoid; rhizomes obscure. Bulb globose, flattened globose, or ovoid-globose, cylindrical with thickened base. Scape fistulose: scape developed; plants propagated by seeds or bulblets. Bulb narrowly ovoid or cylindric-ovoid.

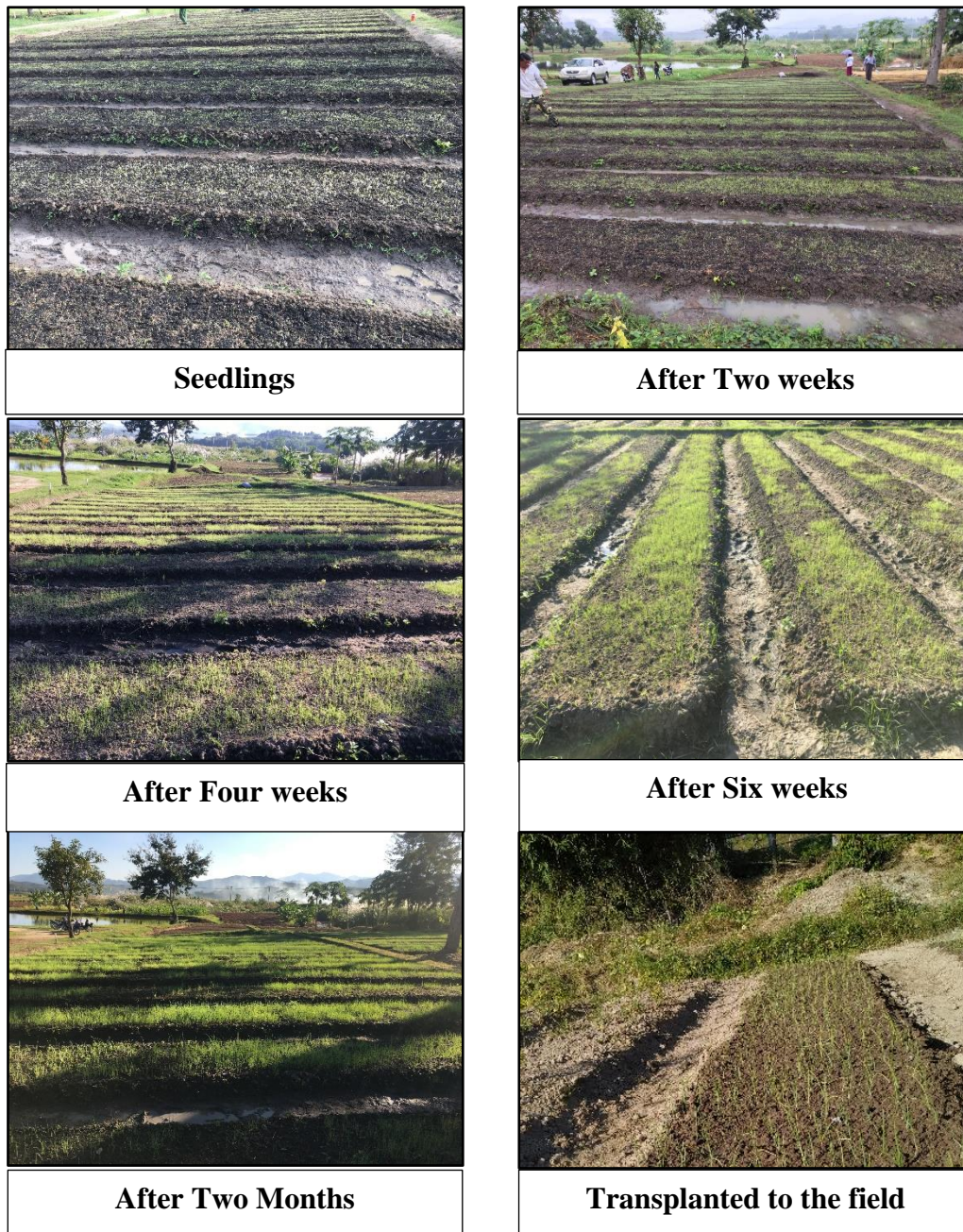


Fig. 1 Nursery Preparation and Transplantation to the field for *Allium cepa* L.



Fig. 2 After Three Months Habit of *Allium cepa* L.

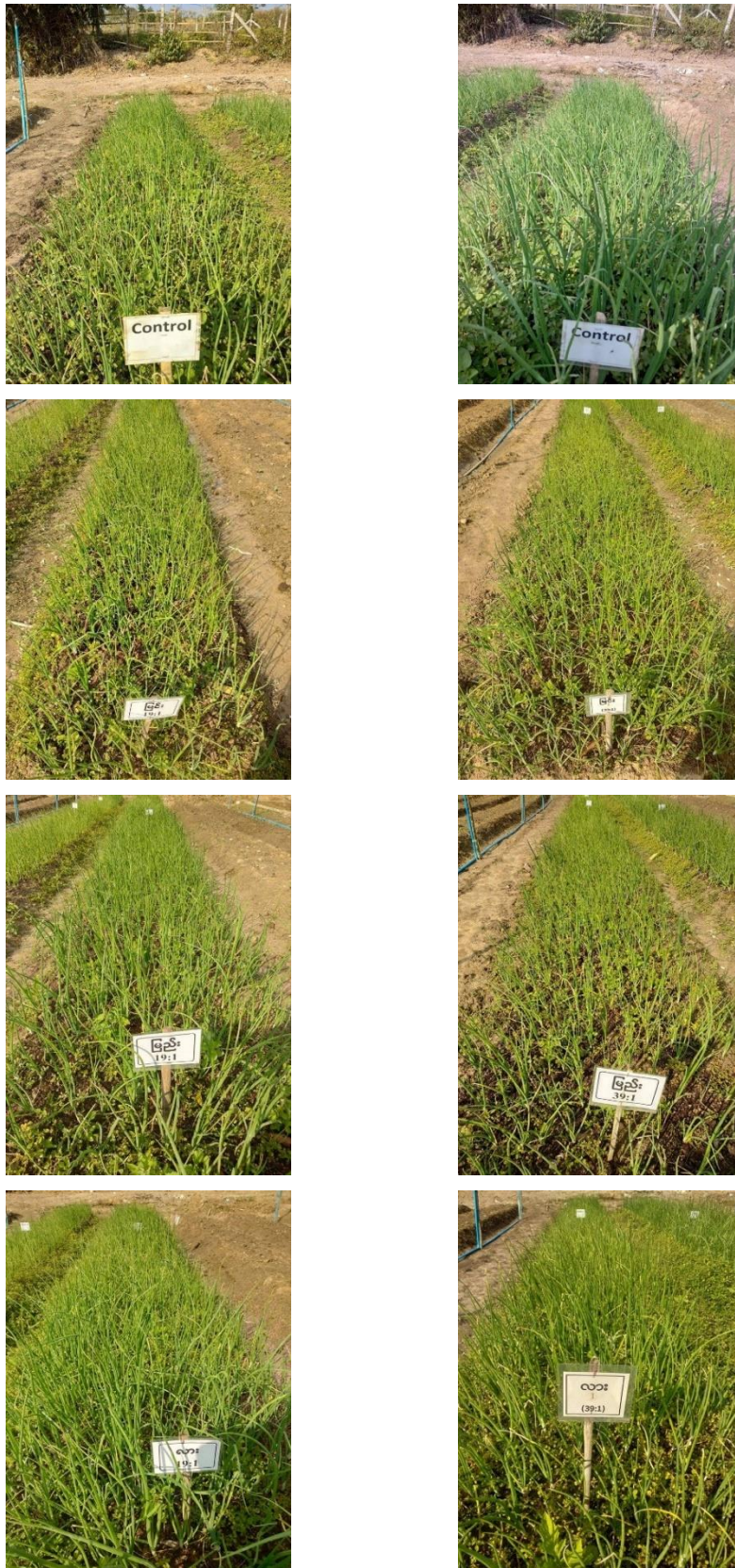


Fig. 3 After Four Months Habit of *Allium cepa* L.

Table. 1 Influence of different ratio and the three different animal manures on plant height, leaves number and leaves area of *Allium cepa* L.

Treatments	Growing Period (DAS)							Mean
	25.12.20	1.1.21	7.1.21	15.1.21	22.1.21	28.1.21	5.2.21	
Plant Height								
Factor A								
Horse (T1)	17.633	23.390	25.277	38.667	50.833	52.113	56.667	264.580
Donkey (T1)	17.190	24.000	25.910	35.113	43.000	52.997	54.003	252.213
Mule (T1)	22.187	30.333	30.823	37.667	51.887	54.777	54.223	281.897
Control (T1)	12.610	28.553	27.220	21.170	45.223	36.557	35.667	207.000
F Value	20.45	3.081	1.318	85.86	10.57	16.42	39.99	
P Value	0.000415 ***	0.0903	0.334	2e-06 ***	0.00372 **	0.000884 ***	3.66e-05 ***	
Factor B								
Horse (T2)	16.163	18.847	24.553	36.170	43.833	48.057	48.557	236.180
Donkey (T2)	19.277	21.833	26.953	35.833	42.553	45.000	42.223	233.673
Mule (T2)	20.420	29.890	32.910	40.777	52.610	45.223	44.000	265.830
Control (T2)	12.610	28.553	27.220	21.170	45.223	36.557	35.667	207.000
F Value	54.27	8.315	3.648	42.71	13.35	5.947	14.71	
P Value	1.16e-05 ***	0.00768 **	0.0636	2.87e-05 ***	0.00176 **	0.0196 *	0.00128 **	
L. No.								0.000
Factor A								
Horse (T1)	3.780	4.447	4.780	5.667	5.110	5.667	4.887	34.337
Donkey (T1)	3.890	4.110	4.890	5.330	6.000	6.110	6.000	36.330
Mule (T1)	4.443	4.667	4.667	6.000	5.777	5.447	6.557	37.557
Control (T1)	3.670	4.110	4.443	4.110	6.000	4.553	5.220	32.107
F Value	12.75	2.018	1.959	54.92	2.862	11.49	15.44	
P Value	0.00205 **	0.19	0.199	1.11e-05 ***	0.104	0.00285 **	0.00109 **	
Factor B								

Horse (T2)	3.780	4.000	5.330	5.890	5.223	5.667	4.777	34.667
Donkey (T2)	3.667	4.000	5.110	5.777	6.223	5.557	6.000	36.333
Mule (T2)	4.113	4.220	4.333	5.667	5.443	5.780	5.557	35.113
Control (T2)	3.670	4.110	4.443	4.110	6.000	4.553	5.220	32.107
F Value	1.304	0.458	15.44	25.25	2.138	11.36	4.116	
P Value	0.338	0.719	0.00109 **	0.000197 ***	0.174	0.00296 **	0.0486 *	
LA								0.000
Factor A								
Horse (T1) (W)	0.452	0.503	0.460	0.737	0.880	1.243	1.003	5.278
Donkey (T1) (W)	0.489	0.467	0.517	0.677	0.990	0.947	1.167	5.253
Mule (T1) (W)	0.760	0.563	0.560	1.157	1.030	1.130	4.180	9.380
Control (T1) (W)	0.273	0.510	0.467	0.370	0.857	0.493	0.560	3.530
F Value	6.052	1.333	1.483	52.62	3.175	31.14	1.063	
P Value	0.0187 *	0.33	0.291	1.31e-05 ***	0.085	9.22e-05 ***	0.417	
Factor A								
Horse (T1) (L)	13.797	17.517	19.387	30.817	38.703	40.933	39.073	200.227
Donkey (T1) (L)	13.583	18.170	20.037	26.723	39.890	42.483	44.740	205.627
Mule (T1) (L)	17.363	21.733	23.077	35.293	39.027	44.813	43.923	225.230
Control (T1) (L)	10.130	21.223	20.973	15.737	34.853	28.593	27.630	159.140
F Value	21.51	3.467	0.65	86.29	1.616	16.89	38.39	
P Value	0.000348 ***	0.0709	0.605	1.96e-06 ***	0.261	0.000802 ***	4.27e-05 ***	
Factor B								
Horse (T2) (W)	0.360	0.470	0.493	0.657	0.723	1.046	0.770	4.520
Donkey (T2) (W)	0.467	0.540	0.553	0.697	0.897	0.801	0.693	4.648
Mule (T2) (W)	0.434	0.543	0.563	1.073	0.897	0.983	0.863	5.358
Control (T2) (W)	0.273	0.510	0.467	0.370	0.857	0.493	0.560	3.530
F Value	9.806	1.195	1.151	81.35	4.398	27.59	2.541	
P Value	0.00468 **	0.372	0.386	2.47e-06 ***	0.0417 *	0.000143 ***	0.13	

Factor B

Horse (T2) (L)	13.520	14.723	18.553	28.683	33.203	37.497	35.150	181.330
Donkey(T2) (L)	19.530	16.790	21.163	28.110	39.647	33.890	34.740	193.870
Mule (T2) (L)	16.173	21.467	26.017	37.333	41.590	37.887	34.927	215.393
Control (T2) (L)	10.130	21.223	20.973	15.737	34.853	28.593	31.687	163.197
F Value	4.762	7.784	3.731	62.32	8.284	7.349	0.613	
P Value	0.0345 *	0.0093 **	0.0606	6.86e-06 ***	0.00776 **	0.011 *	0.626	

Asterisks indicate statistically significant differences compared between group with R version. P value less than 0.05 show with the asterisks symbol (P value: ***P < 0.0001; **P < 0.001; *P < 0.01).

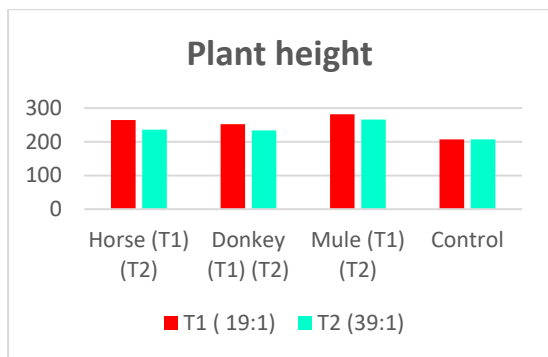


Fig. 4 Comparison of different ratio and the three different animal manures on plant height of *Allium cepa* L.

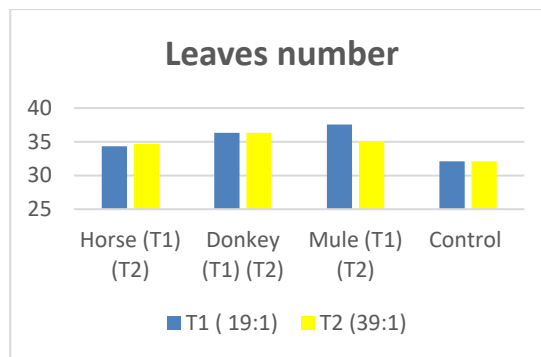


Fig. 5 Comparison of different ratio and the three different animal manures on leaves number of *Allium cepa* L.

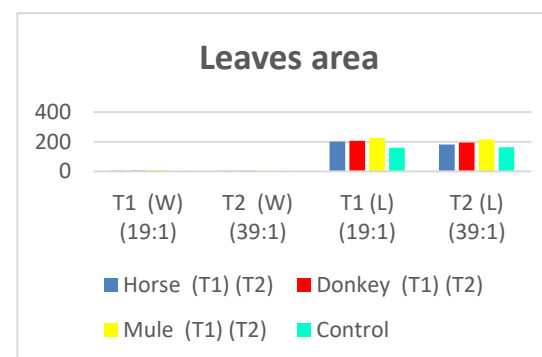


Fig. 6 Comparison of different ratio and the three different animal manures of Leaves area of *Allium cepa* L.

Plant Height

The statistical results of factor A showed that by using three different animal manures, plant heights were highly significant differences 25.12.21, 15.1.21, 22.1.21, 28.1.21 and 5.2.21 DAS. The others DAS were not significant differences. By means plant height comparison of the three different animal manures, the tallest plant height was obtained in T₁ (19:1) in (mule) (281.897 cm) and the shortest height was found from T₁ (19:1) in (control) (207.000 cm).

The results of factor B showed that the different ratios were highly significant differences between every week DAS except 7.1.21. The others DAS were not significant differences. In factor B, by means plant height comparison of the three different animal manures, the tallest plant height was obtained in T₂ (39:1) in (mule) (265.830 cm) and the shortest height was found from T₂ (39:1) in (control) (207.000 cm).

Leaves number

The statistical results of factor A showed that by using three different animal manures, leaves number were significant differences in 25.12.21, 15.1.21, 28.1.21 and 5.2.21. In factor A, by means plant height comparison of the three different animal manures, the tallest leaves number was obtained in T₁ (19:1) in (mule) (37.557 cm) and the shortest height was found from T₁ (19:1) in (control) (32.107 cm).

The results showed that in factor B, by using three different animal manures, leaves number were significant differences in 7.1.21, 15.1.21, 28.1.21 and 5.2.21. In factor B, by means plant height comparison of the three different animal manures, the tallest leaves number was obtained in T₂ (39:1) in (donkey) (36.333 cm) and the shortest height was found from T₂ (39:1) in (control) (32.107 cm).

Leaves area

As the results of the different ratios from factor A, the leaves area was highly significant differences in 25.12.21, 15.1.21 and 28.1.21 DAS. In factor A, by means leaves area comparison of the three different animal manures, the tallest leaves area width was obtained in T₁ (19:1) in (mule) (9.380 cm) and the shortest width was found from T₁ (19:1) in (control) (3.530 cm) and the tallest length was obtained in T₁ (19:1) in (mule) (225.230 cm) and the shortest length was found from T₁ (19:1) in (control) (159.140 cm).

The results showed that in factor B, by using three different animal manures, leaves area were significant differences in 25.12.21, 15.1.21, 28.1.21 and 5.2.21. In factor B, by means leaves area comparison of the three different animal manures, the tallest leaves area width was obtained in T₂ (39:1) in (mule) (5.358 cm) and the shortest width was found from T₂ (39:1) in (control) (3.530 cm) and the tallest length was obtained in T₂ (39:1) in (mule) (215.393 cm) and the shortest length was found from T₂ (39:1) in (control) (163.197 cm).

Discussion and Conclusion

Plants bulbiferous with roots thin leaves without distinct midvein; inflorescence an umbel; leaves usually thick; bulb flattened globose. These characters are agreement with those described by (Backer, 1965; Dassanayake, 1995).

Backer, (1965) reported that bulbs broadly ovoid, globose or depressed-globose, white, yellowish brown, or red; leaves shorter than the peduncle. Umbel mostly without; tepals oval-oblong, obtuse, with a green median band; ovary 3-lobed.

Dassanayake, (1995) stated that single bulbs, broadly ovoid, rounded at apex, cultivated mostly in the dry lowlands, appressed to one another, often angular, subacute at apex.

In this research, *Allium sativum* L., plant height: by means plant height comparison of the three different animal manures, in factor A T₁ (19:1) and in factor B T₂ (39:1). In factor A, the tallest plant height was found by T₁ (19:1) in (mule) (281.897 cm) and the shortest height was found from T₁ (19:1) in (control) (207.000 cm). In factor B, the tallest plant height was obtained in T₂ (39:1) in (mule) (265.830 cm) and the shortest height was found from T₂ (39:1) in (control) (207.000 cm).

The results of *Allium sativum* L., leaves number: by means leaves number comparison of the three different animal manures, in factor A T₁ (19:1) and in factor B T₂ (39:1). In factor A, the tallest leaves number was found by T₁ (19:1) in (mule) (37.557 cm) and the shortest height was found from T₁ (19:1) in (control) (32.107 cm). In factor B, the tallest leaves number was obtained in T₂ (39:1) in (donkey) (36.333 cm) and the shortest height was found from T₂ (39:1) in (control) (32.107 cm).

According to the results of *Allium sativum* L., leaves area: by means leaves area comparison of the three different animal manures, in factor A T₁ (19:1) and in factor B T₂ (39:1). In factor A, the tallest leaves area (width) was found by T₁ (19:1) in (mule) (9.380 cm) and the shortest width was found from T₁ (19:1) in (control) (3.530 cm); the tallest length was obtained in T₁ (19:1) in (mule) (225.230 cm) and the shortest length was found from T₁ (19:1) in (control) (159.140 cm). In factor B, the tallest leaves area width was obtained in T₂ (39:1) in (mule) (5.358 cm) and the shortest width was found from T₂ (39:1) in (control) (3.530 cm); the tallest length was obtained in T₂ (39:1) in (mule) (215.393 cm) and the shortest length was found from T₂ (39:1) in (control) (163.197 cm).

Khin Thwe Thwe Aung, (2014) examined that NPK treated plants (44.76 cm) was observed in the highest plant and cow dung manure treated plants (32.75 cm) was observed in the lowest plant.

Vachhani and Patel, (1993) who observed that plant height was not significantly affected by different fertilizer application. The NPK-applied plants were recorded to have taller plant height (53.26 cm) while the shortest plant (50.01cm) was recorded in control plants. The NPK treated plants were produced the maximum number of leaves (29.15) in per plant while cow dung manure applied plants were observed the minimum (25.36).

Salami and Omotoso, (2018) showed that cow dung rates influenced growth on onion with leaf length, highest number of leaves and tallest plant of 58.94 cm, 6.33 and 53.87 cm respectively.

According to the results of many experiments, most people use raw materials to make animal manures, they prefer to use the things from local manure such as farmyard, cow, pig, compost etc.

However, somewhere found other methods when the joint research of Department of Botany, Kyaing Tong University and No (4), Pack Transport Battalion studied together. The research discovered obvious grow rate of plants and better yield production by using the animal manures of horse, donkey and mule as organic ways.

By seeing above results, highly recommend the local people and farmers to use the animal manures of horse, donkey and mule those are non-side effect and qualified results in their agriculture process.

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