J. Myanmar Acad. Arts Sci. 2020 **Vol. XVIII. No.4A**

STUDY ON GROWTH AND YIELD OF *PSOPHOCARPUS TETRAGONOLOBUS* (L.) DC. ON DIFFERENT TREATMENTS OF CHICKEN COMPOST

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Abstract

The experiment was conducted in Pyay University Campus, Pyay Township, Bago Region. In this experiment, the compost was prepared by the mix of the chicken dung, rice straw and rice bran at 4:2:1. The analyzed results of the compost were moisture percentage of 16.797, the total nitrogen percentage of 0.565, the total phosphorous of 21.43, and the total potassium of 0.792, organic matter of 20.26, organic carbon of 17.54 and the C:N ratio of 6.62. The effectiveness of compost was studied by growing of *Psophocarpus tetragonolobus* (L.) DC., Pe-zaungya, set up in Completely Randomized Design (CRD) contained 4 treatments such as T_1 (Control), T_2 (15g compost plant^{-1}), T_3 (30g compost plant^{-1}), T_4 (45g compost plant^{-1}), each with five replications. The results of vegetative growth showed that the number of leaves per plant, leaf width, leaf length and single leaf area were higher in T_2 (15g compost plant^{-1}). The reproductive growth also showed that the first flowering days was earlier in T_1 (control). The maximum pod width and pod length were observed in T_4 (45g compost plant^{-1}) but number of pods per plant, pods weight per plant, pod yield per treatment and pod yield were higher in T_2 (15g compost plant^{-1}). In this experiment, T_4 (45g compost plant^{-1}) produced the least yield and it was less yield than T_1 (Control). It is therefore concluded that, the lower dose of chicken compost was suitable for the growing of *Psophocarpus tetragonolobus* (L.) DC. as to maintain soil restoration and crop production and also for yield improvement of *Psophocarpus tetragonolobus* (L.) DC.

Keywords: chicken compost, winged bean, CRD

Introduction

The winged bean, *Psophocarpus tetragonolous* (L.) DC. (Pe-zaungya) is a tropical legume plant also known by other names such as asparagus pea, goa bean and manila bean. It belongs to the family Leguminosae. The family has 590 to 690 genera and 12,000 to 1[1]7,000 species. Beans are globally important leguminous vegetables that has been used for several centuries as food for humans and feed for animals. Furthermore beans contain high amounts of protein and vitamins (Mohammad *et al*., 2016). Winged bean seems to prefer sandy loam soils or humus. The plants can tolerate acidic soils up to pH 4.8. In Burma, particularly in the plains, ground is divided in ridges spaced 60 cm broad and 20 to 25 cm high. The Spacing showed that 90 cm spacing both ways, i.e., inter and intra row distance is quite suitable. In Burma, particularly in the plains, ground is divided in ridges spaced 60 cm broad and 20 to 25 cm high. Seeds may be sown 2-5 cm deep and a wide range of population densities have been recommended depending up on seed size (Chandel *et al*., 1984). The entire plant is fit for human consumption from flowers and leaves to tuberous roots and seeds. Green pods have been widely used as a vegetable in South-East-Asia. Tubers are also used in Burma. Winged flour can be used as protein supplement in bread- making. Seeds can also be utilized for making edible oil and milk. The whole plant as well as processed seeds offer excellent animal feed (Sunanda *et al*., 2014).

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Chicken farm wastes (such as chicken manure) were used directly as an organic fertilizer for crops farming. Direct application of chicken dung into agricultural soil may cause environmental problems and it may become the breeding ground of pests such as flies. The biological transformation of chicken dung into environmental friendly and easy to handle organic fertilizer is necessary. Chicken compost contains rich plant nutrients that are vital for their growth including nitrogen, phosphorus, and potassium. In addition to supply of nutrients, the application of chicken farm waste also improves the chemical, physical and biological properties of soil. The transformation of chicken compost into environmental friendly and easy to handle organic fertilizer is necessary (Arifin *et al*., 2006).

The present investigation was undertaken with the aim of this experiment was to observe the yield of *Psophocarpus tetragonolous* (L.) DC. using the chicken compost. The specific objectives were to assess the effect of chicken compost on growth and yield of *Psophocarpus tetragonolous* (L.) DC., to analyze the N,P,K content of chicken compost and to determine the rate of chicken compost on growth and yield of winged bean.

Materials and Methods

Experimental Site

The experiment was conducted at Pyay University campus, Pyay Township, Bago Region during January to March 2018.

Analysis of soil sample and raw materials using chicken compost

Soil sample was collected from the growing area of Pyay University campus before the soil preparation. The collected soil samples, chicken dung, rice straw and rice bran, and also the chicken compost were analyzed in the soil laboratory, Land Use Division, Department of Agriculture, Yangon Region.

Soil Preparation

The soil from the growing area was mixed with ash in the ratio of 5:1 and the soil mix was watered and left for a week for thorough homogenization. Then the soil mixture was put into the polypropylene woven bag (45cm x 38cm).

Raw materials of compost

The composting process was conducted at Lat-pan-aine village, Pyay Township, Bago Region. Chicken dung, rice straw and rice bran were collected near the village. The rice straw was also chopped into 2-3 cm small pieces. Chicken dung, rice straw and rice bran were mixed at 4:2:1 followed by the method of Leif *et al.* (2015).

Composting process

Seventy kilograms of the mixture of the chicken dung, rice straw and rice bran (4:2:1) were put into the Bamboo bin (36"x36"x 36"). Then the bin was covered with the plastic sheet for maintaining the temperature of compost. Temperature was monitored throughout the composting period. Manual turning up of compost was done in every four days throughout the composting period (Figure 1).

Chicken dung Rice bran Rice straw Measuring the temperature Turning the compost Chicken compost

Figure 1 Chicken composting process

Planting material

Wing bean seeds which were used by the farmers in this area were used as the planting material for this research.

Germination Test

Germination test was carried out before sowing seeds in the field. Full cheek seeds were selected without shrinkage were selected for germination test. The selected seeds were germinated in the germinating tray containing sand medium. Four plots were divided in the tray. One plot contained three rows and one row had ten seeds. Therefore, the total numbers of one hundred and twenty seeds were used in the germination test. After one week, the numbers of germinating seedlings were recorded. The germination rate was calculated following the formula developed by Soupe (2009).

$$\text{Germination rate (\%)} = \frac{\text{Total No. of Germinated Seedlings}}{\text{Total No. of Cultivated Seeds}} \text{ x } 100$$

Planting of *Psophocarpus tetragonolobus* L. and Experimental Layout

Five seeds of *Psophocarpus tetragonolobus* (L.) DC. were germinated in a polypropylene woven bag. Two weeks after sowing seeds, different rates of chicken compost treatment: T_1 - control (without compost), T_2 (15g compost plant^{-1}), T_3 (30g compost plant^{-1}). and T_4 (45g compost plant^{-1}) were treated to the assigned plantlet. Each treatment had five replicates were laid out in a completely randomized design (CRD). The spacing between bags was 45 cm and between rows was 45 cm. Hence the total experimental area was 285 cm x 360 cm ((Figure 2). Watering was done every day. Spraying of the organic pesticide such as Tamar pesticide, the extract of *Capsicum annum* and *Alium fruitescens* were carried out when the infestation of plants. Weeding was also carried out whenever it was necessary. The plant height was maintained at a height of 150 cm.

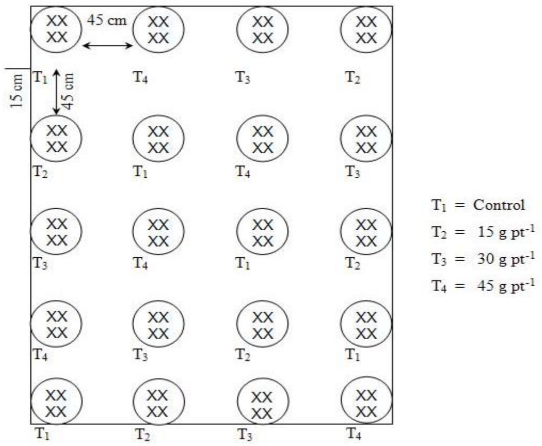

Figure 2 Experimental layout (CRD)

Determination of single Leaf Area

For measuring leaf area, length-width method was used in this experiment. The leaf sample was collected and measured the length and the maximum width and the area was computed as follow:

$$A = K\,L\,W$$

where, A = single leaf area, K =adjustment factor, L = leaf length, W = broadest width

K value varies with the shape of leaf and also it is affected by the variety, nutritional status, and growth stage of the leaf. K value for pulse is 0.70 (Myo Kywe, 1995).

Data Collection

Germination rate, vegetative growth such as petiole length, number of leaves per plant, leaf width, leaf length and single leaf area, reproductive growth like first flowering days, pod length, pod width, pods per plant, pods weight per plant, pods yield per treatment and pod yield were recorded. The collected data were analyzed using IRRISTAT software (6.0). Least significant differences (LSD) at 5% level of significant was used to compare mean differences.

Results

Analysis of soil, chicken dung, rice straw and rice bran and chicken compost

Physico-chemical analysis of the soil revealed that soil was neutral with pH of 7.22. The total nitrogen was 0.46%. It had an exchangeable cation K^+ content of 1.79 meq 100 g^{-1}, an available nutrients P, 66.94 ppm (Olsen), K_2O, 84.19 mg 100 g^{-1}, moisture content of 3.83%, organic carbon, 5.64% and humus content of 10.11% (Table 1).

Table 1 Analyzed results of the experimental soil

Parameters	Composition
Total N (%)	0.46
Exchangeable cation, K^+ (meq 100 g^{-1})	1.79
Available nutrients, P, ppm (Olsen)	66.94
Available nutrients, K_2O (mg 100 g^{-1})	84.19
pH	7.22
Moisture (%)	3.83
Organic Carbon (%)	5.64
Humus (%)	10.11

The analyzed characters of chicken dung (before composting) were the moisture percentage of 6.751, the total nitrogen percentage of 0.919, the total phosphorous of 2.716, and the total potassium of 0.845, organic matter of 10.195 and the C/N ratio of 6.434 (Table 2).

The physico-chemical analysis of the rice straw stated that the moisture percentage of 14.14, the total carbon percentage of 48.57, the nitrogen percentage of 0.70, phosphorous content of 0.253, the potassium percentage of 2.203 and the C/N ratio of 69.38 (Table 2).

The physico-chemical analysis of the rice bran showed that the moisture percentage of 14.98, the total carbon percentage of 52.21, the nitrogen percentage of 1.96, phosphorous content of 1.47, the potassium percentage of 2.08 and the C/N ratio of 26.64 (Table 2).

The analyzed characters of chicken compost revealed that the moisture percentage of 16.797, the total nitrogen percentage of 0.565, phosphorous percentage of 21.43, the potassium percentage of 0.792, organic matter of 20.26, Organic carbon of 17.54, the total carbon percentage of 17.54, the moisture percentage of 16.797 and the C/N ratio of 15.63:1 (Table 2).

Table 2 Nutrient contents of chicken dung, rice straw, rice bran and chicken compost

Parameters	Nutrient Contents			
	Chicken dung	Rice bran	Rice straw	Chicken compost
Total N %	0.919	1.96	0.70	0.565
Total P_2O_5 %	2.716	1.47	0.253	21.43
Total K_2O %	0.845	2.08	2.203	0.792
Total C %	-	52.21	48.57	
Organic matter (%)	10.195	-	-	20.26
Organic carbon (%)	-	-	-	17.54
Moisture (%)	6.751	14.98	14.14	16.797
C:N	6.434	26.64	69.38	15.63:1
pH (1:2.5)	-	-	-	6.62

Measurement of temperature, rainfall and humidity

Weather data was recorded daily from Department of Meteorology and Hydrology, Pyay Township, Bago Region (Table 3).

Table 3 Temperature, rainfall and humidity data of the experiment area from January to March 2018

Date	Mean temp (°C)	Mean Rain fall (mm)	Mean humidity (%)
January, 2018	23.40	0.01	71.80
February, 2018	26.55	-	57.50
March, 2018	29.85	-	54.00

Germination test

Among 30 seeds in each plot, plot 1 had 30 germinated plants (100% of germination), plot 2 had numbers of germinated plants 27 (% of germination), plot 3, 28 germinated plants (% of germination) and plot 4, 25 germinated plants (% of germination), respectively. Therefore average germination rate is 91.67 % (Table 4).

Table 4 Germination rate of *Psophocarpus tetragonolobus* (L.) DC.

Plot	No. of sown seeds	Germinated plants	Germination %
1	30	30	100.00
2	30	27	90.00
3	30	28	93.33
4	30	25	83.33
Average			91.67

Petiole length

The results of petiole length response to chicken compost treatments revealed that T_4 (45g compost plant^{-1}) had the longest length 21.97 cm followed by T_1 (control) 19.64 cm, then T_2 (15g compost plant^{-1}) 19.47 cm and T_3 (30g compost plant^{-1}) had 19.07 cm respectively. The growth in petiole length has increased weekly (Table 5 and Figure 3).

Table 5 Petiole length of *Psophocarpus tetragonolobus* (L.) DC. treated by chicken compost

Treatments	Petiole length (cm)				
	3 WAS	4 WAS	5 WAS	6 WAS	Mean
T_1 (Control)	4.58	4.78	4.89	5.39	19.64
T_2 (15g compost plant^{-1})	4.46	4.67	4.89	5.45	19.47
T_3 (30g compost plant^{-1})	3.92	4.48	5.03	5.64	19.07
T_4 (45g compost plant^{-1})	4.46	5.08	5.71	6.72	21.97
F-Test	0.95	0.66	0.84	1.36	-
5% LSD	ns	ns	ns	ns	-
CV %	15.80	10.10	11.90	17.00	-

WAS =Weeks after sowing CV% = coefficient variation (%) LSD = least significant difference

Number of leaves per plant

The results of number of leaves per plant response to chicken compost treatments showed that T_2 (15g compost plant^{-1}) had much leaves 13.15. The second highest leaf number was observed 11.78 in T_3 (30g compost plant^{-1}), the third highest leaf number T_1 (Control) and the least number was 11.11 T_4 (45g compost plant^{-1}). The growth in number of leaves has increased weekly (Table 6).

Table 6 Numbers of leaves per plant of *Psophocarpus tetragonolobus* (L.) DC. treated by chicken compost

Treatments	Numbers of leaves per plant				
	3 WAS	**4 WAS**	**5 WAS**	**6 WAS**	**Mean**
T_1 (Control)	4.10	6.54	9.60	26.30	11.64
T_2 (15g compost plant^{-1})	5.10	8.10	12.30	27.10	13.15
T_3 (30g compost plant^{-1})	4.20	6.60	11.60	24.70	11.78
T_4 (45g compost plant^{-1})	4.35	5.50	10.80	23.80	11.11
F-Test	ns	ns	*	*	-
5% LSD	1.17	2.82	3.76	10.03	-
CV %	`9.10	30.60	24.60	28.60	-

Leaf width

The mean value of leaf width among the chicken compost treatments gave that T_2 (15g compost plant^{-1}) was highest leaf width 6.62 cm. It was followed by T_4 (45g compost plant^{-1}) 6.26 cm, T_1 (control) 6.09 cm and T_3 (30g compost plant^{-1}) had least leaf width of 5.50 cm respectively. The growth in leaf width has increased weekly (Table 7 and Figure 3).

Table 7 Leaf width of *Psophocarpus tetragonolobus* (L.) DC. treated by chicken compost

Treatments	**Leaf width (cm)**				
	3 WAS	**4 WAS**	**5 WAS**	**6 WAS**	**Mean**
T_1 (Control)	5.71	5.92	6.09	6.63	6.09
T_2 (15g compost plant^{-1})	6.26	6.35	6.82	7.06	6.62
T_3 (30g compost plant^{-1})	5.21	5.37	5.50	5.92	5.50
T_4 (45g compost plant^{-1})	5.56	6.18	6.49	6.80	6.26
F-Test	ns	*	*	ns	-
5% LSD	0.90	0.84	0.91	0.68	-
CV %	11.5	10.1	10.6	7.4	-

Leaf length

The result of the mean leaf length among the chicken compost treatments showed that T_2 (15g compost plant^{-1}) had highest leaf length 5.13 cm. It was followed by T_4 (45g compost plant^{-1}) 4.83 cm, T_1 (Control) 4.75 cm and T_3 (30g compost plant^{-1}) had least leaf length of 4.58 cm respectively. The growth in leaf length has increased weekly (Table 8 and Figure 3).

Table 8 Leaf length of *Psophocarpus tetragonolobus* (L.) DC. treated by chicken compost

Treatments	**Leaf length (cm)**				
	3 WAS	**4 WAS**	**5 WAS**	**6 WAS**	**Mean**
T_1 (Control)	4.47	4.66	4.86	4.99	4.75
T_2 (15g compost plant^{-1})	4.84	5.00	5.21	5.46	5.13
T_3 (30g compost plant^{-1})	4.22	4.56	4.65	4.87	4.58
T_4 (45g compost plant^{-1})	4.41	4.64	4.93	5.33	4.83
F-Test	ns	ns	*	*	-
5% LSD	0.88	0.70	0.64	0.63	-
CV %	14.3	10.8	9.5	8.9	-

Single leaf area

The biggest leaf area were 24.06 cm^2 in T_2 (15g compost plant^{-1}), followed by T_4 (45g compost plant^{-1}) had 21.30 cm^2 and then T_1 (Control) had 20.34 cm^2, T_3 (30g compost plant^{-1}) had 17.87 cm^2 single leaf area. The growth in leaf area has increased weekly (Table 9).

Table 9 Single leaf area of *Psophocarpus tetragonolobus* (L.) DC. treated by chicken compost

Treatments	Leaf area (cm^2)				
	3 WAS	4 WAS	5 WAS	6 WAS	Mean
T_1 (Control)	17.92	19.40	20.81	23.23	20.34
T_2 (15g compost $plant^{-1}$)	21.24	22.89	24.97	27.12	24.06
T_3 (30g compost $plant^{-1}$)	15.68	17.32	18.10	20.39	17.87
T_4 (45g compost $plant^{-1}$)	17.19	20.16	22.47	25.39	21.30
F-Test	ns	ns	ns	ns	-
5% LSD	5.26	5.08	5.32	4.35	-
CV %	21.20	18.50	17.90	13.10	-

The summarized results of vegetative growth stated the effect of chicken compost on *Psophocarpus tetragonolobus* (L.) DC. that the highest petiole length was 21.97 cm in T_4 (45 g compost $plant^{-1}$), the maximum numbers of leaves per plant 13.15 cm, the greatest leaf length 5.13 cm, the largest leaf width 6.62 cm and the broadest single leaf area 24.06 cm^2 in T_2 (15g compost $plant^{-1}$), respectively (Table 10).

Table 10 Summarized vegetative growth on the *Psophocarpus tetragonolobus* (L.) DC. by the treatments of chicken compost

Treatments	Petiole length (cm)	Number of leaves per plant	Leaf width (cm)	Leaf length (cm)	Single leaf area (cm^2)
T_1 (Control)	19.64	11.64	6.09	4.75	20.34
T_2 (15g compost $plant^{-1}$)	19.47	13.15	6.62	5.13	24.06
T_3 (30g compost $plant^{-1}$)	19.07	11.78	5.50	4.58	17.87
T_4 (45g compost $plant^{-1}$)	21.97	11.11	6.26	4.83	21.30

Petiole length Leaf width Leaf length

Figure 3 Vegetative Growth of *Psophocarpus tetragonolobus* (L.) DC.

Reproductive Growth

First flowering days

The mean number of the earliest first flowering days is 58 days in T_1 (Control) followed by 59 days T_3 (30g compost $plant^{-1}$) and T_4 (45g compost $plant^{-1}$), 60 days in T_2 (15g compost $plant^{-1}$) respectively (Table 11 and Figure 4).

Table 11 First flowering days of *Psophocarpus tetragonolobus* (L.) DC.treated by chicken compost

Treatments	First Flowering Days
T_1 (Control)	58
T_2 (15g compost plant^{-1})	60
T_3 (30g compost plant^{-1})	59
T_4 (45g compost plant^{-1})	59
F- Test	ns
5% LSD	1.07
CV %	1.3

Pods per plant

The pods per plant of winged bean had the highest 8.60 T_2 (15g compost plant^{-1}) followed by 7.40 T_3 (30g compost plant^{-1}), 4.40 T_1 (control) and 3.60 T_4 (45g compost plant^{-1}) respectively. According to the statistical analysis showed that all data were significant (Table 12).

Table 12 Effect of chicken compost on pods per plant of *Psophocarpus tetragonolobus* (L.) DC.

Treatments	pods per plant
T_1 (Control)	4.40
T_2 (15g compost plant^{-1})	8.60
T_3 (30g compost plant^{-1})	7.40
T_4 (45g compost plant^{-1})	3.60
F. test	*
CV %	44.70
5%LSD	3.70

Pod Length

The pod length of winged bean had the highest pod length 12.42 cm T_4 (45g compost plant^{-1}) followed by 11.99 cm T_1 (Control), 10.73 cm T_2 (15g compost plant^{-1}) and 9.90 cm T_3 (30g compost plant^{-1}) respectively. According to the statistical analysis showed that all data were non-significant (Table 13 and Figure 4).

Table 13 Effect of chicken compost on single pod length per plant of *Psophocarpus tetragonolobus* (L.) DC.

Treatments	Pod Length (cm)
T_1 (Control)	11.99
T_2 (15g compost plant^{-1})	10.73
T_3 (30g compost plant^{-1})	9.90
T_4 (45g compost plant^{-1})	12.42
F. test	ns
CV %	19.00
5%LSD	2.94

Pod Width

The pod width of winged bean had the largest 5.95 cm T_4 (45g compost plant^{-1}) followed by 5.82 cm T_1 (Control), 5.17 cm T_3 (30g compost plant^{-1}) and 4.90 cm T_2 (15g compost plant^{-1}) respectively. According to the statistical analysis showed that all data were non-significant (Table 14 and Figure 4).

Table 14 Effect of chicken compost on single pod width of *Psophocarpus tetragonolobus* (L.) DC.

Treatments	pod width (cm)
T_1 (Control)	5.82
T_2 (15g compost plant^{-1})	4.90
T_3 (30g compost plant^{-1})	5.17
T_4 (45g compost plant^{-1})	5.95
F. test	ns
CV %	12.30

Pods Weight per plant

The pods weight per plant of winged bean had the highest 73.68 g T_2 (15g compost plant^{-1}) followed by 58.16 g T_3 (30g compost plant^{-1}), 37.46 g T_1 (Control) and 27.42 g T_4 (45g compost plant^{-1}) respectively. According to the statistical analysis showed that all data were non-significant (Table 15 and Figure 4).

Table 15 Effect of chicken compost on pods weight per plant of *Psophocarpus tragonolobus* (L.) DC.

Treatments	pods weight per plant (g)
T_1 (Control)	37.46
T_2 (15g compost plant^{-1})	73.68
T_3 (30g compost plant^{-1})	58.16
T_4 (45g compost plant^{-1})	27.42
F. test	ns
CV %	44.70
5%LSD	30.29

Pod yield per treatment (g)

T_2 (15g compost plant^{-1}) had highest pod yield per treatment 5894.40 g. T_3 (30 g plant^{-1}) had second highest yield 4652.80 g. T_1 (Control) produced 2996.80 g and it had the third yield followed by T_4 (45g compost plant^{-1}) had 2193.60 g (Table 16).

Table 16 Mean pod yield (g) per treatment of *Psophocarpus tetragonolobus* (L.) C. resulted from different rates of chicken compost

Treatments	Pod yield per treatment (g)
T_1 (Control)	2996.80
T_2 (15g compost plant^{-1})	5894.40
T_3 (30g compost plant^{-1})	4652.80
T_4 (45g compost plant^{-1})	2193.60

Pod yield

T_2 (15g compost plant^{-1}) had highest pod yield 3752.55 kg ha^{-1}. T_3 (30g compost plant^{-1}) had second highest yield 2961.28 kg ha^{-1}. T_1 (control) produced 1907.98 kg ha^{-1} and it had the third yield followed by T_4 (45g compost plant^{-1}) had 1170.31 kg ha^{-1} (Table 17).

Table 17 Mean pod yield (kg) of *Psophocarpus tetragonolobus* (L.) DC. resulted from different rates of chicken compost

Treatment	Pod yield (kg ha^{-1})
T_1 (Control)	1907.98
T_2 (15g compost plant^{-1})	3752.55
T_3 (30g compost plant^{-1})	2961.28
T_4 (45g compost plant^{-1})	1170.31

The summarized results of reproductive growth stated the effect of chicken compost on *Psophocarpus tetragonolobus* (L.) DC. The earliest first flowering days was in T_1 (Control). The greatest single pod width, 5.95 cm and pod length, 12.42 cm were investigated in T_4 (45g compost plant^{-1}). The maximum pods per plant 8.60, the broadest pods weight per plant 73.68 g, the best yield per treatment 5894.40 g and pod yield 3752.55 kg ha^{-1} respectively were observed in T_2 (15g compost plant^{-1}) (Table 18).

Table 18 Summarized reproductive growth on the *Psophocarpus tetragonolobus* (L.) DC. by the treatments of chicken compost

Treatments	First Flowering Days	pod width (cm)	pod length (cm)	pods per plant	pods weight per plant (g)	Pod yield per treatment (g)	Pod yield (kg ha^{-1})
T_1 (Control)	58	5.82	11.99	4.40	37.46	2996.80	1907.98
T_2 (15g compost plant^{-1})	60	4.90	10.73	8.60	73.68	5894.40	3752.55
T_3 (30g compost plant^{-1})	59	5.17	9.90	7.40	58.16	4652.80	2961.28
T_4 (45g compost plant^{-1})	59	5.95	12.42	3.60	27.42	2193.60	1170.31

Pod length Pod width Weighting the pods

Figure 4 Reproductive growth of *Psophocarpus tetragonolobus* (L.) DC.

Discussion and Conclusion

This research was conducted during January- March 2018. The growing of *Psophocarpus tetragonolobus* (L.) DC. using chicken compost on plant vegetative growth and reproductive growth were studied. In this experiment, the mixture of chicken dung, rice bran and rice straw in aerobic condition for 30 days was used as compost. This chicken compost was used in the growing of *Psophocarpus tetragonolobus* (L.) DC. The chemical properties of soil analysis stated that the total nitrogen of soil was 0.46%; exchangeable cation K^+, 1.79 meq $100g^{-1}$; available nutrients P, 66.94 ppm; available nutrients K_2O, 84.19 mg $100g^{-1}$; pH, 7.22; moisture, 3.83%; organic carbon, 5.64% and humus, 10.11% (Table 1). This compost was treated to the plants in 15 days intervals from three weeks after sowing to harvesting. The nutrient content of the chicken compost was 0.565, 21.43 and 0.792 percent N, P, K. The C:N ratio of chicken compost was 15.63:1 that should grow in the cultivation. Nutrient status of chicken compost used in the experiment. Manure pH of chicken compost was slightly acidic, 6.62 (Table 2). Arifin *et al*. (2006) revealed the biological transformation of chicken manure via composting technique has its disadvantage because the process may take several weeks to complete. Chicken compost contains rich plant nutrients that are vital for their growth including nitrogen, phosphorus, and potassium. Composted chicken manure provides a slow-release source of macro- and micronutrients and acts as a soil amendment. The germination test before experiment was observed that germination rate was 91.67% (Table 4). Chauhan *et al*. (2009) stated that the seed germination test was to measure the number of healthy well-development seedling. The monthly temperature, rainfall and relative humidity (RH) of the cultivation area were recorded from January to March 2018, the experimental period. The mean temperature 23.40-29.85℃, the rainfall of 0.01 mm and the relative humidity of 54.00- 71.80 % were recorded in this experiment (Table 3). Duke (1981) who reported *Psophocarpus tetragonolobus* (L.) DC. (winged bean) is grown from equator to 25° latitude in temperatures ranging from 15.4 - 27.5℃. The vegetative growth data in this experiment stated that the widest leaf width, 6.62 cm, the longest leaf length, 5.13 cm and maximum single leaf area, 24.06 cm^2 in T_2 (15g compost $plant^{-1}$) were recorded from this experiment (Table 10). The yield components data in this research showed that the earliest first flowering days, 58 DAS in T_1 (control), pod width, 5.95 cm and pod length, 12.42 cm were investigated in T_4 (45 g compost $plant^{-1}$) (Table 18). The earliest first flowering days in this experiment was observed in T_1 (control, without fertilizer treatment). While, the composts and organic fertilizer treatments showed the late flowering days. Tesfaw *et al*. (2013) who found the nutrient supply is also responsible for earliness or late start of blooming. In their result, the plots that received higher levels of fertilizers exhibited prolonged time to commence blooming. The maximum pods per plant 2.87, the broadest pods weight per plant 24.56 g, pods yield per treatment 5894.40 g and the best yield 3752.55 kg ha^{-1} respectively were observed in T_2 (15g compost $plant^{-1}$) (Table 18). Thorne and Evans (1964) reported that the greatest potential for yield was achieved by the high density of leaves area per unit land area but photosynthetic rate of individually leaf will tend to be reduced due to mutual shading. Tesfaw *et al*. (2013) who found the nutrient supply is also responsible for earliness or late start of blooming. In their result, the plots that received higher levels of fertilizers exhibited prolonged time to commence blooming. The maximum pods per plant 2.87, the broadest pods weight per plant 24.56 g, pods yield per treatment 5894.40 g and the best yield 3752.55 kg ha^{-1} respectively were observed in T_2 (15g compost $plant^{-1}$). (Table18). Thorne and Evans (1964) reported that the greatest potential for yield was achieved by the high density of leaves area per unit land area but photosynthetic rate of individually leaf will tend to be reduced due to mutual shading. The chemical composition of chicken compost used in this study is presented in Table (2). This chicken compost was high in phosphorus. The properties of the chicken compost were in accordance with the reference value of chicken compost. These were phosphorous value and the slightly acidic of pH (6.62). The experimental data depended on the levels of chicken compost applied. Plants which had been fertilized by lower levels of chicken compost T_2 (15g compost $plant^{-1}$) produced highest yield than the higher levels application. The lowest level of chicken compost applied gave the highest yield. It was found that the amount of available phosphorous in the compost was high although the lowest level of chicken compost, T_2 (15g compost $plant^{-1}$) was used. It can be concluded that the lower dose of chicken compost (15 g $plant^{-1}$) would be suitable organic soil amendment for soil restoration and crop production and also for yield improvement of winged bean *Psophocarpus tetragonolobus* (L.) DC. according to the resulted data from this experiment. The utilization of chicken compost in lower rates resulted in benefits to farmer and it also enhanced soil fertility. It can be concluded that the lower dose of chicken compost was suitable for the growing of *Psophocarpus tetragonolobus* (L.) DC. as to maintain soil restoration and crop production and also for yield improvement of *Psophocarpus tetragonolobus* (L.) DC.

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