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EFFECT OF ORGANIC AND CHEMICAL FERTILIZERS ON GROWTH AND YIELD OF GARDEN PEA

M. Raihan Uddin[1], Md. Harun-Or-Rashid[2*], Md. Ariful Islam Khalid[3], Md. Asib Biswas[3], Md. Shahriar Kobir[4] and Md. Ashrafuzzaman[5]

[1]Department of Agricultural Extension, Bangladesh, [2*]International Maize and Wheat Improvement Center (CIMMYT), Bangladesh Office, [3]Bangladesh Rice Research Institute, [4]Bangladesh Agricultural Research Institute, [5]Bangladesh Agricultural University

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Corresponding author:
Md. Harun-Or-Rashid

ABSTRACT

A field experiment was carried out at the Crop Botany Field Laboratory of Bangladesh Agricultural University, Bangladesh. It was done during *rabi* season of 2017−18 to study the effect of organic and chemical fertilizers on growth and yield of garden pea (BARI Motor-3). The experiment was laid out in Randomized Complete Block Design (RCBD) with five treatments and four replications. The treatments were T1: Control (no fertilizer), T2: Cowdung + Poultry Manure + Mustard oilcake, T3: Vermicompost + Poultry Manure + Mustard oilcake, T4: Urea + TSP + MoP + Gypsum and T5: Cowdung + Urea + TSP + MoP + Gypsum. Urea, TSP, MoP and gypsum were used as a source of nitrogen, phosphorous, potassium and sulphur @ 45, 90, 40 and 50 kg per ha, respectively. Cowdung, poultry manure, vermicompost and mustard oilcake were also applied as the organic treatments @30, 25, 2.5 and 0.025 ton per per ha, respectively. Amongst the organic and chemical fertilizers, combined application of T5 significantly showed the highest values of vegetative growth and yield attributing characters i.e., plant height, number of branches per plant, number of pods per plant, pod length, pod breadth, number of seeds per pod, 100 seeds weight, pod weight, pod yield and seed yield per hectare. The lowest values of growth and yield attributing characters were recorded from T1. When only chemical fertilizers (T4) were used for plants, they gave higher performance than T2 and T3. Moreover, T5 gave higher result than T4. So, for obtaining the highest growth and yield of pea, T5 is the best combination.

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INTRODUCTION

Pea (*Pisum sativum* L.) is one of the important cool season vegetable crops belongs to family leguminosae, grown all over the world for fresh and processed forms. It is originated in the near East and Mediterranean regions and has been grown since early Neolithic times. Pea (*Pisum sativum* L.) is believed to be native to the Mediterranean region of Southern Europe and to Western Asia comprising Italy and South-Western Asia and India. Later its cultivation was taken up by many countries like France, Japan, Spain, Pakistan etc. (Mithen, 2003). In Bangladesh in the year 2015−16, the area for pea cultivation was 17,931 acres and the production was 7,372 metric ton pers (BBS, 2016).Pea is commonly used in human diet throughout the world, and it is rich in protein (21−25%), carbohydrates, vitamin A and C, Ca, phosphorous and has high levels of amino acids lysin and tryptophan (Bhat *et al*., 2013). The protective polyphenol content called coumestrol is known to prevent stomach cancer which is abundant in garden pea. It is rich source of many minerals such as Fe, Ca, Zn, Cu, Mn etc. which enhance the immune system of our body. Pea contains the antioxidants such as flavonoids, catechin, epicatechin, carotenoid, alpha carotene etc. which are helpful in preventing the aging process of the skin. Green pea is a reliable source of omega-3 fat in the form of alpha-linolenic acid (ALA). Being a leguminous crop, it enriches the soil by fixing atmospheric nitrogen in the soil and provides an effective cover to the land thus restricting soil erosion. Its cultivation maintains soil fertility through biological nitrogen fixation in association with symbiotic *Rhizobium* prevalent in its root nodules and plays a vital role in fostering sustainable agriculture (Negi *et al*., 2006). Therefore, apart from meeting its own requirement of nitrogen, peas are well-known to leave behind residual nitrogen of about 50−60 kg/ha in the soil (Kanwar *et al*., 1990). Modern agriculture is getting more and more dependent upon the supply of synthetic inputs such as chemical fertilizers, pesticides and herbicides etc. which are inevitable to meet high food demand for the growing population in the world. Manufactured fertilizers benefit plants more quickly than organic fertilizer and requires smaller applications. Chemical fertilizers are used to compensate the deficiencies of poor or exhausted soil. Also, they are very useful for the plants because they help a lot in growth. Chemical fertilizers are needed to get good crop yields, but their abuse and overuse can be harmful for the environment and their cost cannot make economic and profitable agricultural products (Bobade *et al*., 1992). The increased use of chemicals under intensive cultivation has not only contaminated the ground and surface water but also distributed the harmony existing among the soil, plant, and microbial population (Bahadur *et al*., 2006). However, excessive, imprudent, and imbalanced use of these inputs may throw devastating impacts on the water, air and soil environments. Probably the soil environment is the most vulnerable to the direct effects of these practices in modern agriculture. They could destroy the soil fertility in a long run which compels the scientific community to look for the alternatives like organic farming (Mishra, 2014). Long-term use of chemical fertilizer can change the soil pH, upset beneficial microbial ecosystems, increase pests and even contribute to the release of greenhouse gases.

Organic farming is a technique which involves the use of biological materials, avoiding synthetic substances to maintain soil fertility and ecological balance thereby minimizing pollution and wastage. Organic farming is an alternative to conventional agriculture for sustainable food and fibre production with high consumer demand. Proponents of organic farming argue that it is a sustainable alternative to conventional farming, providing crops with high export demand and lower environmental impact (Wood *et al*., 2006). Organically grown crops are believed to provide more healthy and nationally superior food for man and animals that those grown with commercial fertilizers. They are more resistant to disease and insect and hence only a few chemical sprays or other protective treatment are required. They improve the soil physical properties such as granulation and good tilt, give good aeration and improve water holding capacity. However, it has also some demerits. Recent research indicates that organic production is about 20% less than conventional production. More tillage is required at organic production.

Production costs are higher because more workers are needed. So, we need to minimize these facts using the combined (organic & chemical) fertilizers. Being a leguminous crop, pea may not need much nitrogen, but an initial stage in the young plants before nodulation stage may exhibit deficiency and it may suffer due to nitrogen starvation, hence small amount of inorganic nitrogen may stimulate early seedling growth and nodulation, leading to an increase in the amount of nitrogen fixed in plant. In case of garden pea, plant can readily absorb and utilize the nutrients and express the highest value in all vegetative and reproductive characters under combined application of organics and inorganics. Keeping in view these facts the experiment entitled “Effect of organic and chemical fertilizers on growth and yield of garden pea” was conducted with the following objectives:

- To study the performance of pea at different organic and chemical nutrient sources.
- To study the combined effect of organic and inorganic sources of nutrients on growth and yield of garden pea.

MATERIALS AND METHODS

Experimental site and soil: The experiment was conducted at the Crop Botany Field Laboratory, Bangladesh Agricultural University, Mymensingh, during *rabi* season of 2017. The farm is situated at the latitude of 24.75 N and longitude of 90.50 E under the AEZ of Old Brahmaputra Floodplain Soil. The land is moderately well drained with a silty loam texture and the reaction of the soil was almost neutral with a pH value of 6.88 at the surface.

Climate: The experimental area belongs to sub-tropical climate and is characterized by high temperature accomplished by moderately high rainfall during *kharif* season (April to September) and low temperature in *rabi* season (October to march). In the *rabi* season temperature is generally low and there is plenty of sunshine. The atmospheric temperature tends to increase from February as the season proceeds towards *kharif.*

Test Crop: The variety BARI Motor-3 was used as the test crop and the seeds were collected from the Horticulture Research Centre of Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur. It was the released variety of Motor, which was recommended by the national seed board.

Land preparation: The land was prepared by ploughing and cross ploughing with a power tiller. Ploughed soil was brought into desirable fine tilth by ploughing and cross- ploughing, harrowing, and laddering. The stubble and weeds were removed. Experimental land was divided into unit plots following the experimental design.

Experimental design and layout: The experiment was laid out in Randomized Complete Block Design (RCBD) with four replications. The entire experimental area was divided into twenty plots. The unit plot size was 1.25 m x 1.25 m; the plots were separated from each other by 60 cm spaces. The treatments were randomly distributed.

Treatments: There were 5 treatments including one control treatment. The treatment combinations for the experiment were as follows-
T1: Control (No fertilizer); T2: Cowdung + Poultry Manure + Mustard Oilcake; T3: Vermicompost + Poultry Manure + Mustard Oilcake; T4: Urea + TSP + MoP + Gypsum; T5: Cowdung + Urea + TSP + MoP + Gypsum

Fertilizer and manure application: Urea, triple super phosphate (TSP), muriate of potash (MoP) and gypsum were used as a source of nitrogen, phosphorous, potassium and sulphur, respectively. Urea, triple super phosphate (TSP) and muriate of potash (MoP) were applied @ 45, 90, 40 and 50 kg per ha, respectively following the BARI recommendation. Cowdung, poultry manure, vermicompost and mustard oilcake were also applied as the organic treatments @ 30, 25, 2.5 and 0.025 ton per per ha, respectively. All the fertilizers except urea were applied during final land preparation. Urea was top dressed in two equal splits at 15 and 30 days after emergence (DAE).

Seed treatment: The collected seeds from BARI were dipped into water for a night to enhance emergence. Then the seeds were treated with carbendazim @ 2.5 gm/kg seeds.

Sowing of seeds: The seeds were sown @ 2−3 seeds per hill on December 15, 2017, in furrows at a depth of 3−5 cm with the spacing of 30 cm X 15 cm.

Intercultural and other operations: Seeds started germination four days after sowing (DAS). Thinning was done two times; the first thinning was done at 8 DAS and the second was done at 15 DAS to maintain optimum plant population in each plot. Just after sowing, light irrigation was given for quick seedling emergence after that 2 irrigation was given during flowering and pod maturity. The crop field was weeded as necessary. There was no infestation of insect pests and diseases in the field during the experimental period and no control measures were adopted. Four plants from each treatment were randomly selected and marked with a sample card. Plant height and number of branches were recorded from selected plants at an interval of 15 days started from 65 DAS (days after sowing) to harvest period.

Harvesting: Harvesting was done when 90% of the pods became mature. The matured pods were collected by hand picking.

Data collection: The following data were recorded- Plant height (cm), No. of branches per plant, No. of pods per plant, Pod length (mm per pod), Pod breadth (mm per pod), No. of seeds per pod, 100 Seeds weight (g), Pod weight (g per pod), Pod yield (t per ha), Seed yield (t per ha)

Procedure of data collection

Plant height (cm): The plant height was measured at 30, 60 and 90 DAS with a meter scale from the ground level to the top of the plants and the mean height was expressed in cm.

No. of branches per plant: The total number of branches per plant was counted from each selected plant. Data were recorded as the average of four plants selected at random of each plot at 55, 70, 85 and 100 DAS.

No. of pods per plant: Number of total pods of selected plants from each plot was counted and the mean number was expressed as per plant basis. Data was recorded as the average of five plants selected at random from the inner rows of each plot.

Pod length (mm per pod): The length of five randomly selected pods from each plot was measured from the point of attachment to the tip of pod in millimeters and then averaged.

Pod breadth (mm per pod): The breadth of five randomly selected pods from each plot was measured at the middle of the pod using scale in millimeters and then averaged.

No. of seeds per pod: At the time of picking ten whole pods were taken out randomly. The pods were shelled for counting the seeds per pod. The seeds per pod were determined by dividing the total number of seeds with corresponding number of pods.

Seeds weight (g): One hundred cleaned, dried seeds were counted from each harvest sample and weighed by using a digital electric balance and weight was expressed in gram (g).

Pod weight (g per pod): Mean weight of pod from five selected plants from each plot was measured in gram.

Pod yield (ton perper ha): Total green pod yield per hectare was calculated by multiplying the yield per plant with the total number of plants per plot. Yield per hectare was determined by considering the area covered by plants.

Seed yield (ton perper ha): The seeds collected from each plot were cleaned. The weight of seeds was taken and converted the yield in t per ha.

Statistical analysis: The mean values of all the characters were calculated and analysis of variance was performed by the 'F' (variance ratio) test. The significance of the difference among the treatment means was estimated by the Least Significant Difference (LSD) at 5% level of probability (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The findings of the experiment have been presented and discussed with the help of table and possible interpretations were given under the following headings:

Plant height (cm): Plant height of BARI Motor-3 was significantly influenced due to application of different organic and chemical fertilizers (Table1). Plant height was measured at 30, 60 and 90 DAS. Plant height ranged from 12.62 to 22.3 cm at 30 DAS, 24.7to 37.5 cm at 60 DAS and 35.11 to 52.13 cm at 90 DAS. The tallest plant of 52.13 cm was found in T5 (Cowdung + Urea + TSP + MoP + Gypsum) at 90 DAS and the shortest plant of 12.62 cm was found in T1 (control) at 30 DAS. Increase in plant growth might be due to hastened meristematic activities, better root growth and better absorption of nutrients (Singh *et al*., 1980) under different nutrient sources (organic and chemical) in the early stage of the life cycle. The highestplant height was recorded when grown with the application of both organic and chemical nutrient sources and significantly lowest plant height was recorded when grown with the application of no nutrient sources. The plant height gradually increased in the order of T5 > T4 > T2 > T3 > T1. This might be due to slow release of nutrients from organic manures but when supplemented with inorganic fertilizers, it might have helped the microorganisms in the faster decomposition of organic manures, thereby increasing the availability of nutrients, especially nitrogen, which helps in protein synthesis and ultimately resulting in higher plant growth rate, more leaves and branches. These findings are an agreement with the findings of Naidu *et al*. (2001) and Singh (2003) in pea.It indicated that the varying level of fertilizer package increased the plant height. Sheikh (1997) and Anjum and Amjad (1999) obtained similar plant height while working with fertilizer levels in garden pea. The present results are in agreement with their findings. Pandita and Pratap (1986) found similar results in plant height of pea by using different fertilizer.

Table 1. Plant height of garden pea at different DAS under different treatments

Treatments	Plant height (cm)		
	30 DAS	60 DAS	90 DAS
T1	12.62 e	24.7 d	35.11 e
T2	16.8 c	31.3 c	45.09 c
T3	16.04 d	30.6 c	43.31 d
T4	18.4 b	34.2 b	48.10 b
T5	22.3 a	37.5 a	52.13 a
LSD (0.05)	0.721	1.088	0.889
CV (%)	2.293	1.835	1.066

*In a column, means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 5% level of probability. LSD (0.05) = Least significant difference at 5% level of probability CV (%) = Coefficient of variation

Number of branches per plant: Number of branches (primary) per plant increased significantly at all the growth stages as result of application of different organic and chemical fertilizers (Table 2). The branches were counted from 55 DAS at 15 days interval, and it was finished at 100 DAS. At 55 DAS, the maximum number of branches per plant (1.3) was recorded under treatment T5 (Cowdung + Urea + TSP + MoP + Gypsum) and the minimum number of branches per plant (1.01) was found under treatment T1(control). Similarly, the maximum number of branches per plant (1.38) at 70 DAS was recorded under treatment T5 as against the minimum number of branches per plant (1.06) under treatment T1. The maximum number of braches per plant (1.41) was recorded at 85 DAS under treatment T5 and minimum number of branches per plant (1.05) under treatment T1. Again, the maximum number of branches per plant (1.41) at 100 DAS was recorded under treatment T5 against the minimum number of branches per plant (1.04) under treatment T1. The highest number of braches per plant (1.41) was recorded at 85 and 100 DAS under treatment T5 among the data which was significantly higher than others.

Table 2. Number of branches per plant of garden pea at different DAS

Treatments	No. of branches per plant			
	55 DAS	70 DAS	85 DAS	100 DAS
T1	1.01 e	1.06 e	1.05 e	1.04 e
T2	1.12 c	1.15 c	1.18 c	1.19 c
T3	1.09 d	1.11 d	1.13 d	1.13 d
T4	1.2 b	1.23 b	1.3 b	1.31 b
T5	1.3 a	1.38 a	1.41 a	1.41 a
LSD (0.05)	0.03	0.021	0.021	0.017
CV (%)	1.72	1.13	1.004	0.874

Number of pods per plant: Number of pods per plant is an important factor among the yield contributing characters. Application of different organic and chemical fertilizers showed statistically significant variation on number of pods per plant of BARI Motor-3 (Table 3). The maximum number of pods per plant (8.04) was recorded at 85 DAS under treatment T5 (Cowdung + Urea + TSP + MoP + Gypsum) which was superior over other treatments whereas the minimum number of pods per plant (4.82) was found at 55 DAS under treatment T1 (control). The results are in agreement with Rao *et al*. (1994).

Table 3. Number of pods per plant of garden pea at different DAS

Treatments	Number of pods per plant			
	55 DAS	70 DAS	85 DAS	100 DAS
T1	4.82 e	4.87 e	4.98 e	5.0 d
T2	5.8 c	6.26 c	6.37 c	6.38 c
T3	5.5 d	6.15 d	6.25 d	6.27 c
T4	6.55 b	7.05 b	7.76 b	7.75 b
T5	7.15 a	7.45 a	8.04 a	8.0 a
LSD (0.05)	0.148	0.058	0.045	0.064
CV (%)	1.302	0.49	0.366	0.57

Pod length (mm per pod): Statistically significant variation was recorded due to application of different organic and chemical in terms of pod length of BARI Motor-3 (Table 4). The maximum pod length (58.1 mm) was recorded under treatment T5 at 100 DAS whereas the minimum pod length (44.15 mm) was found under treatment T1 at 55 DAS. Hoque (1987) reported that there was an insignificant relationship in pod length in mungbean. However, the longer pod length was recorded with the application of conventional source of nutrients and minimum with the application of organic source of nutrients.

Table 4. Pod length of garden pea at different DAS

Treatments	Pod length (mm per pod)			
	55 DAS	70 DAS	85 DAS	100 DAS
T1	44.15 d	46.11 e	47.33 c	47.21 d
T2	48.02 c	50.06 c	50.78 b	51.0 c
T3	47.3 c	48.3 d	50.05 b	49.85 c
T4	52.11 b	55.26 b	56.12 a	56.0 b
T5	56.03 a	57.5 a	58 a	58.1 a
LSD (0.05)	1.674	1.67	2.168	1.14
CV (%)	1.797	1.733	2.188	1.216

Pod breadth (mm per pod): The observation on pod breath has been presented in Table 5. Pod breadth was taken at 55, 70, 85 and 100 DAS. The maximum pod breath (12.45 mm) was recorded under treatment T5 (Cowdung + Urea + TSP + MoP + Gypsum) at 100 DAS which was found superior over other treatments, whereas the minimum pod breath (9.12 mm) was found under treatment T1 (control). With respect to growing condition, the higher pod breadth was recorded in conventional condition and lower in organic condition.

Table 5. Pod breadth of garden pea at different DAS

Treatments	Pod breadth (mm per pod)			
	55 DAS	70 DAS	85 DAS	100 DAS
T1	9.12 c	9.34 d	10.04 e	10.03 d
T2	10.1 b	10.18 c	11.01 c	11.0 c
T3	10.03 b	10.1 c	10.51 d	10.66 c
T4	11.07 a	11.12 b	11.66 b	11.62 b
T5	11.25 a	11.86 a	12.05 a	12.45 a
LSD (0.05)	0.497	0.484	0.229	0.576
CV (%)	2.571	2.421	1.087	2.747

No. of seeds per pod: Statistically significant variation was recorded due to the effect of different organic and chemical fertilizers on the number of seeds per pod of BARI Motor-3 (Table 6). The maximum number of seeds per pod (5.3) was observed from T5 (Cowdung + Urea+ TSP + MoP + Gypsum) at 100 DAS and the minimum number (3.78) was found from T1 at 55 DAS. Thirapom (1992) obtained similar results while working with maize. From the present experiment among different growing conditions, the higher number of seeds per pod were recorded with the application of the conventional sources of nutrient and lower number of seeds per pod were recorded from organic sources of nutrient.

Seeds weight (g): From the observation, it was found that the 100 seeds weight differed significantly from one treatment to another (Figure 1). 100 seeds weight ranged from 19.66 to 23.7 g. The highest 100 seed weight (23.7 g) was found in T5 (Cowdung + Urea + TSP + MoP + Gypsum) and the lowest weight (19.66 g) was obtained from T1 (control treated plants) beacause the plants grew small seeds. The size of seeds of T5 plants were larger than that of others.

Table 6. No. of seeds per pod of garden pea at different DAS

Treatments	No. of seeds per pod			
	55 DAS	70 DAS	85 DAS	100 DAS
T1	3.78 d	3.95 d	4.07 d	4.09 d
T2	4.5 c	4.67 c	4.8 c	4.79 c
T3	4.42 c	4.6 c	4.74 c	4.75 c
T4	4.63 b	4.75 b	4.84 b	4.9 b
T5	4.85 a	5.03 a	5.2 a	5.3 a
LSD (0.05)	0.174	0.109	0.119	0.112
CV (%)	2.106	1.253	1.265	1.325

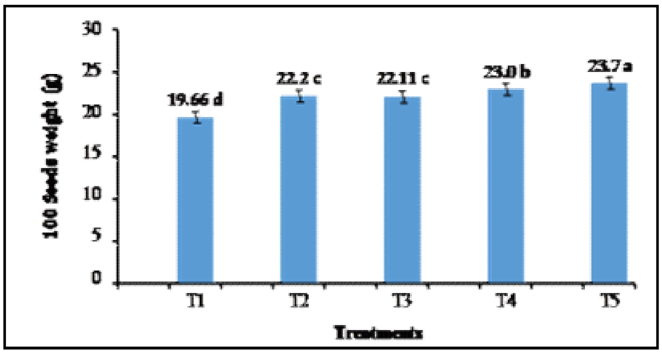

Figure 1. 100 Seeds weight of garden pea under different treatments

Pod weight (g per pod): The pod (fresh) weight varied greatly for different treatments and different harvesting time. Table 7 indicates that maximum pod weight (2.65 g) was recorded under treatment T5 (Cowdung + Urea + TSP + MoP + Gypsum) which was found superior over other treatments, whereas the minimum pod weight (2.01 g) was found under treatment T1 (Control). The weather prevailed during this time was perhaps favorable for the maximum vegetative growth of T5 plants and lead to production of higher photosynthetic products which result in maximum pod weight. These findings are supported by Sachan *et al*. (2003).

Table 7. Pod weight of garden pea at different DAS

Treatments	Pod weight (g per pod)			
	55 DAS	70 DAS	85 DAS	100 DAS
T1	2.01 d	2.09 c	2.16 d	2.19 d
T2	2.26 bc	2.31 b	2.37 c	2.41 c
T3	2.2 c	2.29 b	2.34 c	2.35 c
T4	2.35 ab	2.42 a	2.50 b	2.49 b
T5	2.41 a	2.5 a	2.64 a	2.65 a
LSD (0.05)	0.1	0.096	0.154	0.135
CV (%)	2.388	2.25	3.417	3.182

Pod yield (ton per ha): Figure 4.2 indicates that maximum pod yield per ha (3.81 t), recorded under treatment T5 (Cowdung + Urea + TSP + MoP + Gypsum), was found superior over other treatments whereas the minimum pod yield per ha (2 t) was found under treatment T1 (no fertilizer). The unusually foggy weather prevailed during 2017−18 resulting in inferior yield contributing parameters and as such lower green pod yield. These findings are supported by Sachan *et al*. (2003) and Chandra and Polisetty (1998).

Seed yield (tonper ha): Seed yield is the additive result of the yield contributing characters of pea. The goal of raising crop is to increase the yield. The effect of different treatments on the seed yield of pea was evaluated and the findings are presented in Figure 3. It was found that the seed yield due to application of different organic and chemical fertilizers ranged from 1.16 to 2.06 t per ha. The highest seed yield (2.06 t per ha) was recorded in T5 (Cowdung + Urea + TSP + MoP + Gypsum) and the lowest value (1.16 t per ha) was recorded in T1 (control).

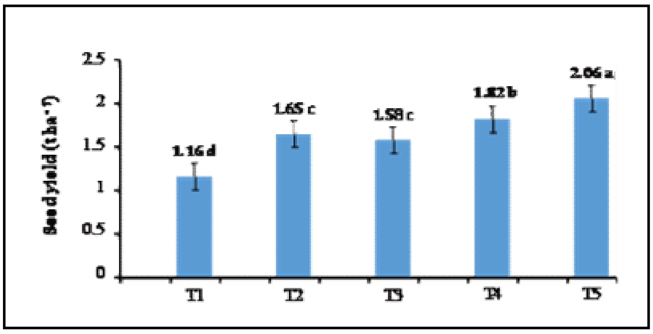

Figure 2. Pod yield of garden pea under different treatments

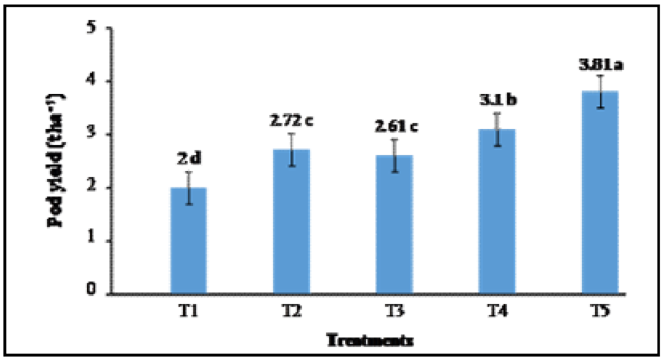

Figure 3. Seed yield of garden pea under different treatments

The seed yield in T2 (Cowdung + Poultry Manure + Mustard oilcake) and T3 (Vermicompost + Poultry Manure + Mustard oilcake) with the value of 1.65 t per ha and 1.58 t per ha, respectively was identical and significantly lower than that of T5 treatment (Figure 4.3). The increase in seed yield with the application of inorganic fertilizers might be due to the greater synthesis and partitioning of metabolites. The sink size improved significantly as reflected by more number of seeds per pod. There was overall elasticity in sink with the higher levels of fertilizers. These finding are corroborations of the results of Akhter *et al*. (1998).

SUMMARY AND CONCLUSION

An experiment entitled "Effect of organic and chemical fertilizers on growth and yield of garden pea" was carried out at the Crop Botany Field Laboratory, Bangladesh Agricultural University, during *rabi* season of 2017. The soil of the experimental site belongs to the Sonatala series under the AEZ of Old Brahmaputra Floodplain Soil. The experiment was laid out in Randomized Complete Block Design (RCBD) comprising 5 treatments with 4 replications. The treatments were T1: Control (No fertilizer), T2: Cowdung + Poultry Manure+ Mustard Oilcake, T3: Vermicompost + Poultry Manure + Mustard Oilcake, T4: Urea + TSP + MoP + Gypsum and T5: Cowdung + Urea + TSP + MoP + Gypsum. In this experiment, the inorganic sources of nutrients were supplied by recommended dose of urea, TSP, MoP and gypsum @ 45, 90, 40 and 50 kg per ha, respectively kg/ha following the BARI recommendation and organic sources of nutrients were supplied by cowdung, poultry manure, vermicompost and mustard oilcake @ 30, 25, 2.5 and 0.025 ton per per ha, respectively. The observations were taken on growth and yield attributing characters. All the data were statistically analyzed by F-test and the mean differences were estimated by DMRT. The growth parameters like plant height, number of branches were significantly influenced by different treatments. The higher values of plant height were recorded in conventional nutrient sources and lower values in organic nutrient sources. The highest numerical values of plant height and number of branches were recorded under treatments T5 (Cowdung + Urea + TSP + MoP + Gypsum). The lowest values of all the growth parameters were noted under treatments T1 (no fertilizer). Yield and yield attributing characters viz. number of pods per plant, pod length, pod breadth, number of seeds per pod, 100 Seeds weight, pod weight, pod yield and seed yield were significantly changed due to the application of different organic and inorganic fertilizers. The combined application of organic and inorganic fertilizers showed positive effect on highest yield and yield attributing characters also. The highest numerical values of number of pods per plant, pod length, pod breadth, number of seeds per pod, 100 Seeds weight, pod weight, pod yield and seed yield were recorded under treatments T5 (Cowdung + Urea + TSP+ MoP + Gypsum). The lowest values of all the yield attributing parameters were noted under treatments T1 (no fertilizer). Amongst the organic and chemical fertilizers, combined application of T5 showed significantly highest value of vegetative growth and yield attributing characters i.e. plant height, number of branches per plant, number of pods per plant, pod length, pod breadth, number of seeds per pod, 100 seeds weight, pod weight, pod yield and seed yield per hectare. The lowest value of growth and yield attributing characters were recorded from T1. From the observation, we can tell that vermicompost is an useful manure which can be used for better performance of pea and other crops but cowdung gave better (sometimes similar) results than vermicompost with the combination of chemical fertilizer. When only chemical fertilizers (T4) were used for plants, they gave higher performance than T2 and T3. Moreover, T5 gave higher result than T4. So, for obtaining the highest growth and yield of pea, T5 is the best combination.

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