Vol 3 No 2 June 2022 Pages 45-49 e-ISSN 2708-5694

Journal of Agriculture, Food and Environment (JAFE)

Journal Homepage: http://journal.safebd.org/index.php/jafe

http://doi.org/10.47440/JAFE.2022.3209

Original Article

Effects of Organic Manures on Growth and Yield of Cabbage

Haque SMR[1], Mondal MF[1], Hassan MK[1], Islam MN[2], Hoque MMI[3], Ahamed S[4] and Bir MSH[5]*

[1]Department of Horticulture, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh.
[2]Department of Agriculture Extension (DAE), Khamarbari, Dhaka
[3]East-West Seed Bangladesh Private Limited, ACI Centre 245, Tejgaon Industrial Area, Dhaka-1208, Bangladesh
[4]Supreme Seed Company Limited, Uttara, Dhaka-1230
[5]Department of Crop Science, Chungnam National University, Daejeon 34134, Korea

Article History

Received: 21 May 2022

Revised: 26 June 2022

Accepted: 29 June 2022

Published online: 30 June 2022

***Corresponding Author**

Bir MSH, E-mail: biragron@gmail.com

Keywords

Cabbage; organic manure; fertilizer; growth; yield

How to cite: Haque SMR, Mondal MF, Hassan MK, Islam MN, Hoque MMI, Ahamed S and Bir MSH (2022). Effects of Organic Manures on Growth and Yield of Cabbage. J. Agric. Food Environ. 3(2): 45-49.

A B S T R A C T

An investigation was made on growth and yield performance of cabbage (*Brassica oleracea* var. *capitata*) under different organic manures and fertilizers at the Horticulture Farm of Bangladesh Agricultural University, Mymensingh during the period from October 2017 to March 2018 to investigate the effect of organic manures on the growth and yield of cabbage. The experiment was laid out in a randomized complete block design (RCBD) with three replications. Result of the experiment revealed that the different combinations of organic manure significantly influenced all the parameters studied. Maximum marketable yield per hectare (55.5 ton) was obtained when T_5 (cowdung @ 2 t/hectare + compost @ 2.5 t/hectare + mustard oil cake @ 0.25 t/hectare + poultry manure 1.8 t /hectare) was applied, while the lowest was obtained from the control treatment. So T_5 (cowdung @ 2 t/hectare + compost @ 2.5 t/hectare + mustard oil cake @ 0.25 t/hectare + poultry manure 1.8 t /hectare) was found suitable for growth and yield of cabbage.

Introduction

Cabbage (*Brassica oleracea* var. *capitata* L.) is a popular green leafy vegetable of the family Brassicaceae. It is an herbaceous, biennial, dicotyledonous flowering plant distinguished by a short stem crowned with a mass of leaves, typically green but in some varieties red or purple, which while immature form a characteristic compact, globular cluster (cabbage head). Cabbage is a great source of vitamin C, with a moisture content of 60.6%. It also contains vitamin B complex, potassium, and calcium (Haque KMF, 2006). Cabbage ranks second in terms of production and area among all vegetables grown in Bangladesh. It is grown on an 18 thousand hectares area with a total production of 312 thousand tons (BBS, 2017), but the yield is poor. The reasons for such low cabbage production are due to a lack of use of modern technologies, such as judicious fertilizer application and proper cultural management practises. This low cabbage yield could be increased by adopting improved production practices. Crop production costs are relatively similar when organic and inorganic fertilizers are used (Haque, 2000). Cowdung, compost, poultry manure, and MOC are all available in our country and are excellent providers of various nutrients. The use of organic fertilisers improves the organic matter status of the soil. Again, just a few studies on the influence of cowdung, compost, chicken manure, MOC, and in combination with NPK fertilisers on cabbage growth and yield were reported in Bangladesh. As a result, the current study was designed to assess the impacts of organic manures on cabbage growth and yield.

Materials and Methods

The experiment was carried out at the Horticultural Farm of Bangladesh Agricultural University in Mymensingh, Bangladesh, from October 2017 to March 2018 to investigate

the effect of organic manure on cabbage growth and yield. The selected area was a medium high land under AEZ-9. The soil texture of the area was silty loam belonging to the Old Brahmaputra Flood Plain (UNDP, 2011). The pH of the soil is 6.85, and it contains limited organic matter. Atlas 70 was the cabbage variety chosen for the experiment. The seedlings of cabbage were raised at the Horticulture Farm of the Bangladesh Agricultural University in Mymensingh. On October 19, 2017, 10gm of seeds were mixed with soil and sown in a seed bed. The seeds were then gently covered with light soil and compacted. Weeding and irrigation were done as needed when germination was complete.

The trial included the following treatments: T0 = Control, T1 = NPK (at 100, 15, and 20 kg/ha, respectively (BARC, 2012). T2 = 8 t/ha cowdung T3=5 t/ha cowdung + 2.5 t/ha compost T4 = 4 t/ha cowdung + 1.5 t/ha compost + 1 t/ha mustard oil cake T5 = 2 t/ha cowdung + 2.5 t/ha compost + 0.25 t/ha mustard oil cake + 1.8 t/ha poultry manure The single factor experiment used randomized complete block design (RCBD) with three replications. A total area of 113.4 m2 (12.6m9m) was divided into three equal replication blocks, each with six plots. As a result, the total number of unit plots was 18. Each plot measured 2.0 m 1.6 m. The experiment's treatment combinations were randomized at random to six plots, each with three replications. The remaining space between two plots was 50 cm, while the gap between blocks was 100 cm. Healthy and uniform sized 22 days-old seedlings were transplanted in the Experimental plots on 17th November, 2017. Intercultural operations were carried out when needed. The following parameters were measured: Plant height, number of leaves per plant, fresh weight of loose leaf, fresh weight of roots, number of roots per plant, diameter of head, thickness of head, weight of marketable head, number of folded leaf per plant, number of folded leaf per plant, days required for head formation, percentage of head formation, days required for head maturity, gross yield per plot, marketable yield per plot, gross yield per hectare, marketable yield per hectare, dry matter content.

Results

Plant height

Plant height trends at different DAT have been shown. The influence of different organic manures caused a considerable variation in plant height, which was statistically significant at different DAT. At 70 DAT, the highest plant (26.01 cm) was found in the T5 treatment (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha), while the shortest plant (21.76 cm) was found in the T0 treatment (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure (control).

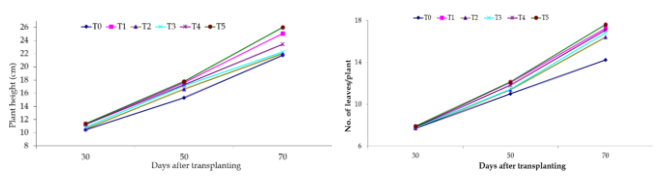

Fig.1. Effects of different organic manures on plant height of cabbage at different days after transplanting.

(T_0 = Control, T_1 = NPK (recommended dose), T_2 = Cowdung @ 8 t/ha, T_3 = Cowdung @ 5 t/ha + compost @ 2.5 t/ha, T_4 = Cowdung @ 4 t/ha + compost @ 1.5 t/ha + mustard oil cake @ 1 t/ha, T_5= cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha +poultry manure 1.8 t /ha. Vertical bar represents LSD at 1% level of probability.)

Number of leaves per plant

Plant height trends at different DATs have been shown in Fig. 2. Due to the influence of different organics, a significant difference in plant height was observed that was statistically significant at different DATs. At 70 DAT, the plants treated with T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha) had the highest number of leaves per plant (17.60), whereas the plants treated with T0 (control) had the lowest number of leaves per plant (14.23).

Fresh wt. of loose leaf

The effects of different organic manures on fresh weight of loose leaf were significant (Table-1). The plants grown under T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha) had the highest fresh wt. of loose leaf (0.601 kg), however the plants grown under T0 (control) had the lowest fresh wt. of loose leaf (0.362 kg).

Number of lateral roots

Because of the influence of different organic manures and fertilisers, a significant variation in the length of roots was observed, which was found to have statistically significant (Table-1). The plants treated with T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha) had the highest number lateral roots (17.00), while the plants treated with T0 (control) had the lowest number (11.33).

Diameter of head

Different organic manures and fertilisers had a significant effect on head diameter (Table-1). The plants with the largest diameter of head (15.83 cm) were grown with T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha), while the plants with the smallest diameter of head (12.47 cm) were grown with T0 (control).

Thickness of head

It would appear that the various organic manures and fertilisers had a significant effect on the thickness of the head (Table-1). The T5 treatment (cowdung at 2 t/ha, compost at 2.5 t/ha, mustard oil cake at 0.25 t/ha, and poultry manure at 1.8 t/ha) showed the highest thickness of head (10.10 cm), whereas the T0 treatment (control) gave the lowest thickness of head (8.57 cm).

Fresh weight of head/plant

The highest fresh weight of head (1.10 kg) was found in plants grown with T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha), while the lowest fresh weight of head (8.57 cm) was found in plants grown with T0 (control), and this difference was statistically significant.

Number of folded leaf/plant

The highest number of folded leaf leaf/plant (30.68) was found in plants grown under treatment T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha), while the lowest number of folded leaf leaf/plant (26.67) was found in plants grown under treatment T0 (control), and the difference was found.

Table 1. Effects of organic manures on growth contributing characteristics of cabbage.

Treatments	Fresh wt. of loose leaf (kg)	No. of lateral roots	Diameter of head (cm)	Thickness of head (cm)	Fresh wt. of head/plan t (kg)	No. of folded leaf/plant
T0	0.362	11.33	12.47	8.57	0.63	26.67
T_1	0.570	16.50	15.68	9.90	1.09	29.80
T_2	0.465	12.40	13.27	8.61	0.68	24.50
T_3	0.429	13.50	13.47	8.80	0.71	26.22
T_4	0.420	14.20	14.73	9.40	0.89	28.56
T_5	0.601	17.00	15.83	10.10	1.11	30.68
LSD0.05	0.06	1.13	0.95	0.36	0.12	1.64
LSD0.01	0.08	1.61	1.36	0.52	0.16	2.33
Level of significance	**	**	**	**	**	**

(T_0 = Control, T_1 = NPK (recommended dose), T_2 = Cowdung @ 8 t/ha, T_3 = Cowdung @ 5 t/ha + compost @ 2.5 t/ha, T_4 = Cowdung @ 4 t/ha + compost @ 1.5 t/ha + mustard oil cake @ 1 t/ha, T_5= cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha +poultry manure 1.8 t /ha. Vertical bar represents LSD at 1% level of probability.)

Dry matter content of head

The influence of different organic manures caused a significant variation in the dry matter content of the head, which was statistically significant at different treatments (Table-2). The plants grown under T5 treatment had the highest dry matter content (5.35 kg) (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha), while the plants grown under T0 treatment had the lowest dry matter content (0.362 kg) (control).

Days required for head formation

Different organic manure management significantly affected the number of days required for head formation (Table-2). The plants grown under the treatment T5 (cowdung @ 2 t/ha + compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure @ 1.8 t/ha) required comparatively the fewest days (52 days) to form a head, while those grown under the treatment T0 (control) required the maximum days (64 days).

Days required for head maturity

While the crop was in the field, the days required for head maturity were recorded. The influence of different organic manures and fertilisers caused a significant variation in the days required for head formation, which was statistically significant at different treatments (Table-2). The plants grown under T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha) required the minimum days (75 days) to head maturity, while the plants grown under T0 (control) required the maximum days (88) to head maturity.

Percentage of head formation

The days required for head maturity were recorded while the crop was in the field. The influence of different organic manures and fertilisers resulted in a statistically significant variation in the days required for head formation at different treatments (Table-2). Plants grown under T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha) required the relatively short time to reach head maturity (75 days), while plants grown under T0 (control) required the longest time (88 days).

Gross yield per plot

The gross yield per plot was significantly affected by different organic manures (Table2). The maximum gross yield (29.28 kg) per plot was observed in T_5 treatment (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t /ha while the lowest gross yield/plot (16.32 kg) was observed in the plants treated with T_0 (control).

Gross yield per hectare

Different organic manures had a significant impact on the gross yield of cabbage per hectare (Fig-3). The T5 treatment (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha) obtained the highest gross yield/ha (91.50 kg), while the T0 (control) treatment resulted the lowest gross yield/ha (81.50 kg) (51.00 kg).

Marketable yield per plot

Different organic manures showed significant effect in respect of marketable yield/plot (Table-2). Highest Marketable yield/plot (17.76 kg) was found in the plants grown under the treatment T_5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t /ha) while the lowest marketable yield/plot (9.65 kg) was observed in the plants treated with T_0.

Marketable yield per hectare

The variation among marketable yield/ha of cabbage obtained from different treatments was highly significant due to the different sources of nutrients. The highest marketable yield of cabbage (55.50 ton/ha) per plot was obtained from the treatment T_5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t /ha) but the lowest marketable yield/ha (30.16 kg) was observed in the plants treated with T_0 (control).

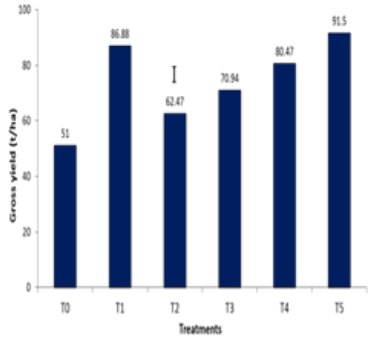

Fig. 3. Effects of different organic manures on gross yield (t/ha) of cabbage.

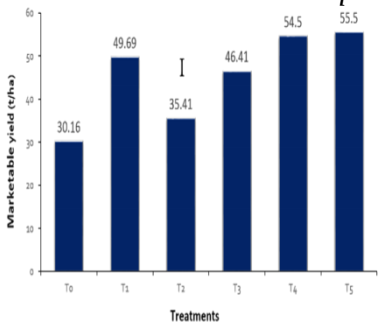

Fig. 4. Effects of different organic manures on marketable yield (t/ha) of cabbage.

(T_0 = Control, T_1 = NPK (recommended dose), T_2 = Cowdung @ 8 t/ha, T_3 = Cowdung @ 5 t/ha + compost @ 2.5 t/ha, T_4 = Cowdung @ 4 t/ha + compost @ 1.5 t/ha + mustard oil cake @ 1 t/ha, T_5 = cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha +poultry manure 1.8 t /ha. Vertical bar represents LSD at 1% level of probability.

Table 5. Effects of organic manures on yield contributing characteristics of cabbage.

Treatments	Dry matter content (%)	Days required to head formation	Days required to head maturity	Percentage of head formation	Gross yield/plot (kg)	Gross yield (t/ha)	Marketable yield/plot (kg)	Marketable yield/ha (ton)
T0	5.35	64.00	88.00	81.00	16.32	51.00	9.65	30.16
T_1	6.49	54.00	77.00	89.00	27.80	86.88	15.90	49.69
T_2	5.85	57.00	85.00	83.00	19.99	62.47	11.33	35.41
T_3	5.68	58.00	82.00	86.00	22.70	70.94	14.85	46.41
T_4	5.95	55.00	79.00	88.00	25.75	80.47	17.44	54.50
T_5	7.12	52.00	75.00	92.00	29.28	91.50	17.76	55.50
LSD0.05	0.25	2.28	3.59	2.93	0.91	2.85	1.32	4.12
LSD0.01	0.36	3.24	5.11	4.16	1.30	4.06	1.88	5.87
Level of significance	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability

(T_0= Control, T_1= NPK (recommended dose), T_2=Cowdung @ 8 t/ha, T_3= Cowdung @ 5 t/ha + compost @ 2.5 t/ha, T_4=Cowdung @ 4 t/ha + compost @ 1.5 t/ha + mustard oil cake @ 1 t/ha, T_5= cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha +poultry manure 1.8 t /ha.)

Discussion

The results of the effects of organic manures on growth and yield contributing characters of cabbage have been discussed in this portion.

Effects of organic manures on growth and yield of cabbage

Organic manures had significant effects on plant height, leaf spread of plant, number of leaves per plant, length of the largest leaf, breadth of the largest leaf, fresh weight of loose leaf, length of roots, fresh weight of roots, number of roots per plant, diameter of head, thickness of head, weight of marketable head, number of loose leaf per plant, number of unfolded leaf per plant, days required for head formation, percentage of head formation, days required for head maturity, gross yield per plot, marketable yield per plot, gross yield per hectare, marketable yield per hectare, dry matter content.

When T5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t/ha) was applied, the highest plant height (26.01 cm) at 70 DAT, number of leaves per plant (17.60), length of roots (16.40 cm), fresh weight of roots (0.039 kg), number of lateral roots (17.00) were recorded. In contrast, lowest plant height at (21.76 cm) at 70 DAT, number of leaves per plant (14.23), length of roots (15.27 cm), fresh weight of roots (0.027 kg), number of lateral roots (11.33), were recorded from the control treatment (T0).

In comparison to the use of chemical fertilisers, mixed organic manures treatment in farmland indicated that mixed organic manures boosted soil concentrations of organic carbon, nitrogen, phosphorus, and potassium, resulting in rapid vegetative growth (T5). Islam *et al* (2014) also reported similar findings in case of plant height in their study. The results of the experiment partially support the findings of Farooque and Mondal (1987).

The maximum diameter of head (15.83cm), thickness of head (10.10 cm),fresh weight of head/plant (0.89 kg), minimum days required to head formation (52.00), minimum days required to head maturity (79.00), highest percentage of head formation (92.00), were recorded at T_5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha +poultry manure 1.8 t /ha) and minimum diameter of head (12.47 cm), thickness of head (8.57cm), fresh weight of head/plant (0.63 kg), maximum days required to head formation (64.00), maximum days required to head maturity (88.00), lowest percentage of head formation (81.00), were recorded at T_0 (control). It might be due to increased metabolic activities resulting higher metabolite accumulation and proper head formation that lead to increase weight of

head per plant and reduced the time required for head formation and maturity by applying mixed organic manures treatment as compared to control. These findings are in agreement with the observation of Subhan (1988) who reported that application of manure reduced the number of days for cabbage, head formation as well as maturity. The results of the experiment also support the findings of Zohora (2012).

Maximum gross yield per plot (29.28 kg), gross yield per hectare (91.50 ton), marketable yield per plot (17.76 kg) and marketable yield per hectare (55.50 ton) were recorded at T_5 (cowdung @ 2 t/ha+ compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t /ha) and minimum gross yield per plot (16.32kg), gross yield per hectare (51.00 ton), marketable yield per plot (9.65kg) and marketable yield per hectare (30.16 ton) were recorded at T_0 (control). The higher dose of mixed organic manures provided the plants with enough nutrient components which facilitated synthesis of metabolites and activation of certain enzymes that resulted higher gross and marketable yield. This finding is agreed with the result of other researchers in cabbage (Bhardwaj *et al*. 2000; Beresniewiez and Mpbwosielski, 1985). The observation is very close to Mahmud (1996).

Conclusion

The purpose of the experiment was to determine the influence of different levels of organic manure on cabbage growth and production. From the results, it can be concluded that applying different levels of organic fertilizer have a significant effects on cabbage growth and yields. The highest gross and marketable yields were obtained at the combination from the application of cowdung @ 2 t/ha + compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t /ha. On the other hand, the lowest yield per hectare was obtained from the control treatment (without application of manures and fertilizers). Therefore, a judicious application of cowdung @ 2 t/ha + compost @ 2.5 t/ha + mustard oil cake @ 0.25 t/ha + poultry manure 1.8 t /ha is helpful for increasing the growth and yield of cabbage. The findings of the study may be applicable to other locations of the country as well. However, further research work at different doses of organic manures on the growth and yield of cabbage will need to be performed in different agro-ecological zones of Bangladesh to reach a specific conclusions and recommendations.

References

BARC (2012). Fertilizer Recommendation Guide 2012. Bangladesh Agricultural Research Council, Farmgate, Dhaka. p. 113.

BBS (2017). Year Book of Agricultural Statistics – 2017. Bangladesh Bureau of Statistics, Statistics and Information Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh. p. 155.

Beresniewiez A, Nowosielski O (1985). Influence of increasing mineral fertilization level accompanied by organic manuring and liming on yields of vegetable crops and soil salinization. Vegetable Crops Research Bulletin Work 28, 71-78.

Bhardwaj ML, Harender R, Koul BL (2000). Yield response and economics of organic sources of nutrients as substitutes to inorganic sources in tamato (*Lycopersicon eseulentum)*, okra (*Hibiscus esculentus*), cabbage (*Brassica oleracea* var. capitata) and cauliflower (*B. oleracea* var. botrytis). Indian Journal of Agricultural Science **70** 653-656.

Farooque AM, Mondal MF (1987). Effect of spacing and levels of nitrogen on growth and yield of cabbage. Bangladesh Horticulture 15 (2): 1-6.

Haque KMF (2006). Yield and Nutritional Quality of Cabbage As Affected By Nitrogen and Phosphorous Fertilization. Bangladesh Journal of Scientific and Industrial Research, 41: 41-j46.

Haque MO (2000). Effects different fertilizer management practices on the growth and yield of ratoon crop of cabbage. MS thesis, Department of Horticulture, Bangladesh Agricultural University, Mymensingh. pp. 96: 78-90.

Islam MM, Karim , Shariar S, Amin R, Nizam R (2014). Growth and Yield Potential of Broccoli Influenced by Organic Manures. Bangladesh Research Publications Journal 145-150.

Mahmud MS (1996). Effect of different levels of nitrogen and their time of application on the growth and yield of cabbage. MS Thesis, Department of Horticulture, Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 28-36.

Subhan (1988). Effect of organic materials on growth and production of cabbage (*Brassicea oleracea* L.). Peletitian Horticulture Bulletin 16 (4): 37-41.

UNDP (2011). Land Resource Appraisal of Bangladesh for Agricultural Development Report 2: Agro Ecological Regions of Bangladesh, FAO, Rome, Italy p. 577.

Zohora FT (2012). Effect of different levels of nitrogen, pinching and age of seedling on the growth and yield of cabbage; MS Thesis, Department of Horticulture, Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 28-36.