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Interaction effect of cowdung and neem leaf on stem Amaranth

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ABSTRACT

To study the effect of cowdung and neem leaf (*Azadirachta indica*) on growth and development of stem amaranth (*Amaranthus oleraceus*), an experiment was conducted in experimental plots under a research project, Department of Agroforestry, Bangladesh Agricultural University, Mymensingh following Randomized Block Design with two factor named cowdung and doses of chopped neem leaf with nine treatments and three replications (M_0N_0, M_0N_1, M_0N_2, M_1N_0, M_1N_1, M_1N_2, M_2N_0, M_2N_1, M_2N_2) from 20 February 2008 to 30 April 2008. Plant height (cm), leaf number, stem diameter (mm), plant weight at harvest (g) and yield (t ha^{-1}) were recorded at 14, 21, 28, 35, 42, 49, 56 and 63 days after sowing with the help of a meter scale and weight machine. It was evident that, the maximum value of collected data was found from 10 t ha^{-1} of cowdung with 2 t ha^{-1} of neem leaf (M_2 x N_2) interaction. Whereas the minimum value was obtained from the interaction of control (M_0 x N_0) treatment at 14, 21, 28, 35 and 56 DAS and the treatment combinations of 5 t ha^{-1} cowdung with 1 t ha^{-1} neem leaf (M_1 x N_1) and 10 t ha^{-1} of cowdung with no neem leaf (M_2 x N_0) was statistically similar. So, it is evident that 10 t ha^{-1} of cowdung with 2 t ha^{-1} of neem leaf is beneficial for the production of stem amaranth as this combination influenced the plant height, leaves per plant, stem diameter and yield of stem amaranth.

INTRODUCTION

Vegetables are important for human nutrition in terms of bioactive nutrient molecules such as dietary fiber, vitamins and minerals and non-nutritive phytochemicals. Among different vegetables Amaranth is recognized as an easy-to-grow and very productive crop. It is probably the highest-yielding leaf vegetable of the tropics. Its excellent nutritional value makes it an important vegetable for human nutrition, both in rural areas for home consumption and as a cheap green vegetable in city markets. Stem amaranth (*Amaranthus oleraceus*) is a herbaceous vegetable crop, which belongs to the family Amaranthaceae. It is one of the important vegetable crops in Bangladesh and India. The climate is very suitable for the production of this crop in Bangladesh. It is locally know as "Danta". The area, production and average yield per acre in 2005-06 was 20 thousand acre, 24 thousand metric tons and 2.30 tons, respectively (BBS, 2006). But the yield is quite low in comparison to that of other countries. Although considered a poor man's food its nutritional value as popular as many other high priced vegetables. The nutritional value of tender Amaranthus is high, per 100 g edible portion contains-Moisture 85.70 g, fibre 1.0 g, protein 4.0 g, mineral 2.7 g, carbohydrate 6.3g, calcium 397 mg, iron 25.5 mg, magnesium 247 mg, phosphorus 83 gm, sodium 230 mg, thiamin 0.03 mg, riboflavin 0.10 mg, potassium 341 mg, sulphur 61.0 mg, vitamin-A 9200 I.U. and vitamin-C 99 mg (Bose and Som, 1986). Among the vegetables crops stem amaranth is the most important source of supplying valuable roughages which prevent constipation of human. To ensure the nutrient of increased population of Bangladesh we should give attention about the economic production of this nutritionally rich crop. Organic and inorganic fertilizers are essential for plant growth but commercial and subsistence farming has been and

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is still relying on the use of inorganic fertilizers for growing crops (Masarirambi et al., 2010). This is because they are easy to use, quickly absorbed and utilized by crops. The continued dependence of developing countries on inorganic fertilizers has made prices of man agricultural commodities to skyrock. The chemical fertilizers used in conventional agriculture contain just a few minerals which dissolve quickly in damp soil and give the plants large doses of minerals (Masarirambi et al., 2010) but major limitation to the usage of chemical fertilizers is due to the adverse effects they have on plant quality and disease susceptibility. A continual dependence on chemical fertilizers may be accompanied by a fall in organic matter content, increased soil acidity, degradation of soil physical properties and increased rate of erosion due to instability of soil aggregates. So, modern and ecologically friendly organic farming is the only solution. Organic fertilizers have positive effect on root growth by improving the root rizoster conditions (structure, humidity etc.) and also plant growth is encouraged by increasing the population of microorganisms (Fatma et al., 2007). Considering the above facts we can use cowdung and neem leaf as organic manure in case of stem amaranth production where cowdung is good manure for crop cultivation, which contains moisture 79.05%, organic matter 18.50%, nitrogen 0.572%, phosphorus 0.096% and potassium 0.520% (Miller, 1959). Neem is known as a good pesticide, it contains Azadirachtin, a botanical insecticide (Singh, 2004). Neem leaves is most effective against cutworms and other soil born insects and nematodes. It is non-toxic to human and pest specific so keeps the environment sound and equitable. Considering the above stated situation, the present study was undertaken to study the combined effect of cowdung and neem leaf on growth, development and yield of stem amaranth.

MATERIALS AND METHODS

The experiment was conducted at research field of the Department of Agroforestry, Bangladesh Agricultural University, Mymensingh from 20 February to 30 April 2008. The trail was set up on February 20, 2008 following Randomized Block Design (RCBD) with three replications of nine treatments (M_0N_0, M_0N_1, M_0N_2, M_1N_0, M_1N_1, M_1N_2, M_2N_0, M_2N_1, M_2N_2) where there were two factors. The stem amaranth (*Amaranthus oleraceus*) variety used in the experiment was kharif season variety named "Red Tower" with different doses of cowdung and chopped neem ((*Azadirachta indica*)) leaves. Different doses of manure (M_0 = 0g/ control, 750g/5 t ha^{-1}, M_2 = 1500g /10 t ha^{-1}) and Chopped Neem leaf (N_0 = 0g /control, N_1 = 150g /1 t ha^{-1}/ M_2 = 300g /2 t ha^{-1}) were set up at this experiment. Well decomposed cowdung and fine chopped and semi dried neem (*Amaranthus oleraceus*) were used obtained at the experiment through two hours sun drying and 22 hours air drying the collected leaves. Seed was sown in a continuous line sowing method on 5th March, 2008 maintaining a inter row distance of 40 cm and 2 cm depth where seed rate was 1 kg ha^{-1} where each plot was 1.5 m x 1 m = 1.5 m^2. Different intercultural operation such as weeding, thinning out, irrigation and mulching were done as and when necessary. Data on different parameters named plant height (cm), leaf number, stem diameter (mm), plant weight at harvest (g), yield (t/ha) from 10 plants per plot were recorded . The height of plants was measured in centimeter from the ground level to the tip of the shoot at unit plot at 14, 21, 28, 35, 42, 49, 56 and 63 days after sowing with the help of a meter scale and the stem diameter was collected from the same sample plants at 21, 28, 35, 42, 49 56 and 63 days after sowing in millimeter. The collected data were analyzed using computer MSTAT-C program by using the "Analysis of variance" (ANOVA) technique. Mean separation was done by Duncan's Multiple Range Test (DMRT).

RESULT AND DISCUSSION

Interaction effect on plant height

The interaction effect of cowdung and neem leaf on plant height of stem amaranth was found significant at 21 to 63 DAS but insignificant at 14 DAS. The variation among the treatment combinations was statistically significant (Table 1). At 14, 21, 28, 35 and 56 DAS the treatment combinations 5 t ha^{-1} of cowdung with 1 t ha^{-1} leaf (M_1 x N_1) and 10 t ha^{-1} of cowdung with no neem leaf (M_2 x N_0) was statistically similar. In general, plant height increased gradually with the passing of time up to 63 DAS (Table 1). The highest plant

height (57.91 cm) at 63 DAS was recorded from the treatment combination of 10 t ha^{-1} of cowdung with 2 t ha^{-1} of neem leaf (M_2 x N_2). The second highest plant height (52.21 cm) was found in 10 t ha^{-1} of cowdung and 1 t ha^{-1} of neem leaf (M_2 x N_1) combination. The minimum plant height was found in control treatment (M_0 x N_0). The results of the research work conducted by Bhttacharya et al. (2004) also support this result.

Table 1
Interaction effect of cowdung and neem leaf on plant height.

Interaction (Cowdung X Neem leaf)		Periodical plant height (cm)							
		14 DAS	21 DAS	28 DAS	35 DAS	42 DAS	49 DAS	56 DAS	63 DAS
M_o	N_o	1.21 a	1.83 i	3.48 h	5.52 h	9.38 i	13.68 i	16.46 h	19.57 i
	N_1	2.21 a	2.25 h	4.56 g	6.05 g	10.97 h	16.03 h	20.78 g	25.46 h
	N_2	2.42 a	3.94 g	5.03 f	6.52 f	13.16 g	19.60 g	24.77 f	28.47 g
M_1	N_o	3.45 a	4.80 f	6.27 e	12.70 e	18.98 f	25.34 f	29.68 e	34.57 f
	N_1	4.58 a	7.33 d	9.97 d	17.59 d	26.72 d	34.91 d	41.51 d	46.44 d
	N_2	5.35 a	7.50 c	10.30 c	18.75 c	28.73 c	37.43 c	43.30 c	49.53 c
M_2	N_o	4.59 a	6.72 e	9.76 d	17.35 d	25.87 e	34.21 e	41.34 d	46.09 e
	N_1	5.60 a	8.14 b	11.74 b	20.21 b	31.80 b	41.17 b	47.36 b	52.21 b
	N_2	6.25 a	9.00 a	12.70 a	22.57 a	35.06 a	44.27 a	52.31 a	57.91 a
Level of significance		NS	***	***	***	***	***	***	***

*** Significant at 0.1% level of probability; NS: Non Significant
DAS: Days after sowing, M_0 = No cowdung, M_1 = 5 t ha^{-1} cowdung and M_2 =10 t ha^{-1} cowdung, N_0 = No Neem leaf, N_1 = 1 t ha^{-1} Neem leaf and N_2 = 2 t ha^{-1} Neem leaf.

Table 2
Interaction effect of cowdung and neem leaf on number of leaves per plant.

Interaction (Cowdung×Neem leaf)		Number of leaves per plant							
		14 DAS	21 DAS	28 DAS	35 DAS	42 DAS	49 DAS	56 DAS	63 DAS
M_o	N_o	3.67 f	5.13 g	7.60 f	8.47 h	11.33 h	14.20 h	17.87 i	20.87 h
	N_1	3.80 f	5.47 f	7.73 f	8.93 g	12.73 g	14.93 g	18.73 h	21.00 h
	N_2	3.87 f	6.33 e	7.87 f	9.67 f	13.73 f	17.40 f	22.40 g	26.33 g
M_1	N_o	4.33 e	6.67 d	9.14 e	14.07 e	18.20 e	23.33 e	28.67 f	31.87 f
	N_1	5.07 c	7.40 c	12.27 c	15.27 c	21.00 d	29.00 d	38.13 d	44.20 d
	N_2	5.73 b	8.33 b	12.73 b	18.40 b	23.40 c	29.67 c	38.73 c	44.87 c
M_2	N_o	4.73 d	6.93 d	11.07 d	14.67 d	20.73 d	28.67 d	37.47 e	43.20 e
	N_1	6.27 a	7.67 c	12.67 b	18.73 b	28.40 b	38.20 b	46.87 b	52.20 b
	N_2	6.47 a	8.73 a	13.47 a	21.87 a	30.80 a	40.33 a	49.80 a	55.93 a
Level of significance		***	*	***	***	***	***	***	***

***Significant at 0.1% level of probability; * Significant at 5% level of probability
DAS: Days after sowing, M_0 = No cowdung, M_1 = 5 t ha^{-1} cowdung and M_2 =10 t ha^{-1} cowdung, N_0 = No Neem leaf, N_1 = 1 t ha^{-1} Neem leaf and N_2 = 2 t ha^{-1} Neem leaf.

Interaction effect on number of leaves per plant

The interaction effect of cowdung and neem leaf on number of leaves per plant was found significant at 21 DAS but highly significant at 14 DAS and 28 to 63 DAS. The variation among the treatment combination was significant (Table 2). It was interesting that at 42 and 49 DAS the treatment combinations t ha^{-1} of cowdung with 1 t ha^{-1} of neem leaf (M_1 x N_1) and 10 t ha^{-1} of

cowdung with no neem leaf (M_2 x N_0) was statistically similar. At 63 DAS, the highest number of leaves (55.93) per plant was recorded from the treatment combinations of 10 t ha^{-1} of cowdung with 2 t ha^{-1} of neem leaf (M_2 x N_2), followed by 10 t ha^{-1} of cowdung with 1 t ha^{-1} of Neem leaf (52.20), while the lowest value (20.87) was obtained from the control treatment ((M_0 x N_0) (Table 2). Specific report on this character is not available. But the research findings of Ragvendra et al. (2001) and Devi *et al.* (2003) is relevant to this character.

Interaction effect on stem diameter

The interaction effect of cowdung and neem leaf on the stem diameter of stem amaranth was significant at different DAS. It was found that the treatment combinations 10 t ha^{-1} cowdung with 2 t ha^{-1} of neem leaf (M_2 x N_2) and 10 t ha^{-1} of cowdung with 1 t ha^{-1} of Neem leaf (M_2 x N_1) was statistically similar at 21, 28, 35, 42 and 49 DAS. The combinations M_1 x N_1 and M_2 x N_0 was also statistically similar at 21 and 28 DAS. The widest diameter of the stem (20.58 mm) at 63 DAS was recorded from the interaction of 10 t ha^{-1} of cowdung with 2 t ha^{-1} of neem leaf (M_2 x N_2), followed by (18.17 mm) in the interaction of 10 t ha^{-1} of cowdung with 1 t ha^{-1} of Neem leaf. The minimum stem diameter (7.23 mm) was recorded from the interaction of M_0 x N_0 (control) treatment (Table 3). Different research reports indicated that increased plant weight and yield may also caused by increase in stem diameter.

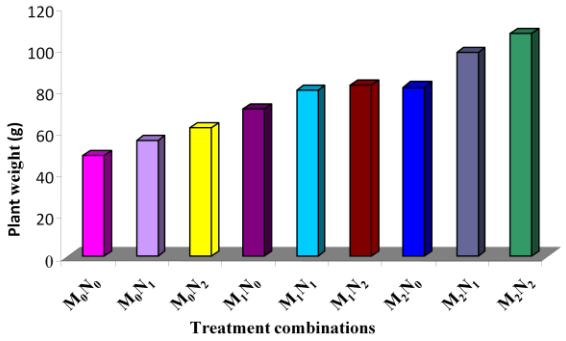

Figure 1
Interaction effect of cowdung and Neem leaf on plant weight of stem amaranth.

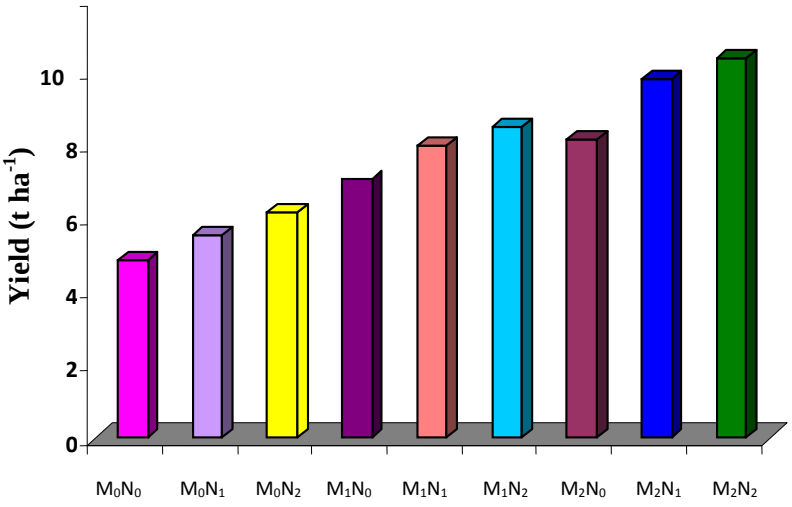

Figure 2
Interaction effect of cowdung and Neem leaf on yield of stem amaranth.

Effect on plant weight at harvest

The plant weight was significantly influenced due to the interaction of cowdung and neem leaf .It was evident that, the maximum weight of plant (107.20 g) was found from 10 t ha^{-1} of cowdung with 2 t ha^{-1} of neem leaf (M_2 x N_2) interaction. Whereas the minimum weight of plant (48.53 g) was obtained from the interaction of control (M_0 x N_0) treatment (Figure 1). It is evident that treatment combination M_1 x N_2 and M_2 x N_0 are statistically similar (Table 3). Mondal *et al.* (2005) also found similar kind of results in his research.

Interaction Effect on yield (t ha^{-1})

The data related to the interaction effect of cowdung and neem leaf was found significant in this regard. The experimental results showed that the maximum yield (10.39 t ha^{-1}) was found from 10 t ha^{-1} of cowdung and 2 t ha^{-1} of neem leaf (M_2 x N_2). The minimum yield (4.85 t ha^{-1}) was from control (M_0 x N_0) treatment (Fig. 10). It is evident that treatment combinations M_1 x N_1, M_1 x N_2 and M_2 x N_0 are statistically similar (Table 3). This result is an agreement with the results of Mamta *et al*. (2005).

Table 3
Interaction effect of cowdung and Neem leaf on stem diameter, plant weight at harvest and yield.

Interaction (Cowdung× Neem leaf)		Stem diameter (mm) at different days after sowing							Plant weight at harvest (g)	Yield (t ha^{-1})
		21 DAS	28 DAS	35 DAS	42 DAS	49 DAS	56 DAS	63 DAS		
M_o	N_o	1.40 f	1.80 g	2.37 h	3.60 h	4.77 h	6.17 i	7.23 i	48.53 h	4.85 h
	N_1	1.50 ef	2.07 f	2.73 g	4.13 g	5.53 g	7.37 h	9.33 h	55.60 g	5.56 g
	N_2	1.70 de	2.40 e	3.47 f	4.80 f	6.13 f	7.93 g	10.07 g	61.63 f	6.16 f
M_1	N_o	1.80 d	2.60 d	4.27 e	5.63 e	7.00 e	8.93 f	11.00 f	71.03 e	7.10 e
	N_1	2.60 c	3.40 c	5.73 c	7.83 c	9.93 c	12.47 d	14.17 d	79.93 d	7.99 d
	N_2	2.87 b	3.67 b	7.53 b	9.20 b	10.87 d	13.07 c	15.00 c	82.37 c	8.50 c
M_2	N_o	2.40 c	3.33 c	5.23 d	7.03 d	8.83 d	11.23 e	13.67 e	81.50 c	8.18 cd
	N_1	3.20 a	4.27 a	7.73 a	9.50 a	11.47 a	15.17 b	18.17 b	98.27 b	9.83 b
	N_2	3.40 a	4.40 a	7.80 a	9.60 a	11.60 a	17.23 a	20.58 a	107.20 a	10.39 a
Level of significance		***	**	***	***	***	***	***	***	**

*** Significant at 0.1% level of probability, ** Significant at 1% level of probability
M_0 = No cowdung, M_1 = 5 t ha^{-1} cowdung and M_2 =10 t ha^{-1} cowdung, N_0 = No Neem leaf, N_1 =1 t ha^{-1} Neem leaf and N_2= 2 t ha^{-1} Neem leaf, DAS: Days after sowing

From the study it is evident that all the growth and yield parameters were significantly affected by the interaction of cowdung and neem leaf from 14 to 63 DAS except plant height at 14 DAS. The highest plant height, number of leaves per plant, stem diameter, plant weight and yield were found from the interaction of 10 t ha^{-1} cowdung manure (M_2) with 2 t ha^{-1} neem leaf (N_2) treatments i.e. M_2 x N_2. The lowest performance in all the cases was obtained from the interaction of control treatment. i.e. no cowdung with no neem leaf (M_0 x N_0). It was evident that the treatment combination M_1N_2 and M_2 N_1; and M_0 N_0 and M_0 N_2 were statistically similar for plant height and stem diameter at 14 DAS. The treatment combination M_1 N_1 and M_2 N_0 were also statistically similar for plant height at 14, 28, 35 and 56 DAS. For number of leaves per plant the combination M_1 N_1 and M_2 N_0 were statistically identical at 42 and 49 DAS. We can also observe that among the combinations M_1 N_1, M_1 N_2 and M_2 N_0, there was no statistical variation for yield performance of the crop. Results obtaining from the study integrated that M_2 (10 t ha^{-1}) of cowdung and N_2 (2 t ha^{-1}) of Neem leaf is

responsible for highest rate of growth and development of stem amaranth. Therefore, it may be said that cowdung and neem leaf as organic manure can be used for higher crop cultivation. Moreover neem leaf has pest repellent properties as a botanical pesticide. If organic farming is to be popularized cowdung and neem leaf can be one of the means. Significant incensement of stem length, diameter and finally yield are influenced by combined effect of cowdung and neem leaf is recorded in this experiment. It is also showed that as the doses of manure and neem leaf is higher, effect is also higher.

CONCLUSION

It can be concluded interaction effect of 10 t ha^{-1} of cowdung with 2 t ha^{-1} of neem leaf is beneficial for the production of stem amaranth as this combination influenced the different parameter named plant height, leaves per plant, stem diameter, plant weight at harvest and yield of stem amaranth. It is also notified that no use of mentioned organic sources resulting less production of stem amaranth.

REFERENCES

BBS (2006). Monthly Statistical Bulletin, Bangladesh, September, 2006. Bangladesh Bureau of Statistics. Stat. Div., Minst. of Planning, Govt. of the Peaple's Repub. of Bangladesh, Dhaka. p. 49.

Bhattacharya SP, Sitangshu Karmakar AJ and Ghatak SS (2004). Effective of neem Saar (organic manure) on yield components and yield of kharif paddy. Dept. of Agron. Bidhan Ch. Kr. Viswavidyalaya, Indian. Environment and Ecology, 22 (Spl-4): 684-686.

Bose TK and Som MG (1986). Vegetable Crops in India. Naya Prakash, Calcutta, India. PP. 670, 675.

Devi HJ, Maity TK and Paria NC (2003). Effect of different sources of nitrogen on yield and economics of cabbage. Department of Vegatable Crops. Bidhan Chandra Krishi Viswavidyalay, Mohanpur, India. Environ. and Eco. 21 (4): 478-880.

Gomez KA and Gomez AA (1984). Statistical Procedure for Agricultural Res. 2nd edn. John Wiley and Sons, New York. p. 680

Mamta Jha MM and Sanjeev K (2005). Influence of organic manure, irrigation interval and cropping sequence on the yield and black scurf disease of potato. Dept. Plant Path., Rajendra Agric. Univ., Pusa, Samastipur (Bihar), India. Annals of Agri-bio Research, 10 (1): 61-64.

Millar CE (1959). Soil Fertility. John Willey and Sons, Inc. New York, Chapman and Hall Ltd. London. P. 34.

Mondal SS, Debabrata A, Arup G and Bug A (2005). Integrated nutrient management on the growth, productivity and quality of potato in Indo Gangetic plains of West Bengal. Dept. Agron., Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia 741252, West Bengal, India. Journal of potato, 32 (1/2): 75-78.

Ragvendra, Ali MK and Kubra Bano (2001). Relative efficiencies of green leaf vermicompost on nodulations, nutrient uptake and dry matter yield of French been. Current Res. Univ. of Agric. Sci. Bangalore. 30 (5/6): 72-74.

Singh RP and Singh AK (2004). Efficiency of bio-pesticides in controlling leaf webber of grain amaranth in high hills of Uttaranchal. Indian. Journal of Hill Farm. 17 (1/2): 136-138.