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EFFECT OF SOURCE AND RATE OF COMPOST ON THE YIELD AND YIELD COMPONENTS OF LENTIL

M. S. U. Bhuiya and M. J. Rahman, N. Islam
Department of Agronomy, Bangladesh Agricultural University, Mymensingh.

Abstract: The experiment was carried out at the Agronomic Field Laboratory, Bangladesh Agricultural University, Mymensingh during the period from November 2006 to March 2007 to study the effect of source and rate of compost on the yield and yield components of lentil. Two factors-sources of compost (*Sesbania rostrata*, water hyacinth and farm compost) and rates of compost (5.0, 10.0, 15.0 and 20.0 t ha^{-1}) were included in the experiment. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Only one variety of lentil, variety- BINA Masur 2 was included as experimental crop. Source of compost significantly influenced the plant population, number of branches $plant^{-1}$, number filled pods $plant^{-1}$, number of sterile pods $plant^{-1}$, number of total pods $plant^{-1}$, number of seeds $plant^{-1}$, 1000-seed weight (g) and seed yield (t ha^{-1}). The highest seed yield (0.81 t ha^{-1}) was recorded in *S. rostrata* compost and lowest (0.79 t ha^{-1}) in farm compost. The results of the experiment also indicated that plant population, plant height (cm), number of branches $plant^{-1}$, number of filled pods $plant^{-1}$, number of sterile pods $plant^{-1}$, number of total pods $plant^{-1}$, number of seeds $plant^{-1}$, seed yield (t ha^{-1}), straw yield (t ha^{-1}) and biological yield were significantly affected by the rate of compost. Significantly highest seed yield (0.90 t ha^{-1}) was produced by the application of compost @ 20 t ha^{-1} than other rates. The interaction effect between source *(S. rostrata)* and rate (20 t ha^{-1}) of compost on the seed yield of lentil was significant and the highest seed yield (0.96 t ha^{-1}) was recorded by the application of *S. rostrata* compost @ 20 t ha^{-1}.
Key words: Lentil, source of compost, rate of compost

Introduction

Lentil (*Lens culinaris* L. Medik) is one of the most important pulse crops grown in Bangladesh. This commonly grown pulse crop belongs to the sub family Papilionaceae under the family Leguminosae. In Bangladesh it is popularly known masur. The lentil crop covers 30 percent of the total area under pulses and shares approximately 31 percent of the total requirement of pulse in the country (BBS, 2005). It occupies a unique position in the world of agriculture by virtue of its high protein content and capacity for fixing atmospheric nitrogen. In developing country like Bangladesh, pulse constitutes the major concentrate source of dietary protein. It is considered as the poor man's meat as it is the cheapest source of protein for under privilege people who can not afford to buy animal protein (Gowda and Kaul, 1982). At present, pulses are beyond the reach of the poor people because of its sky kissing price. The protein content of lentil seed is found to vary from 25.70 to 33.40 percent (Singh *et al*., 2001). Lentil being a legume crop can fix atmospheric nitrogen through root nodule by Rhizobium bacteria which may reduce the pressure of nitrogenous fertilizer application to the crops. It is evident that pulse containing cropping pattern helped to increase the soil organic matter in the soil (Islam, 1989). In order to achieve high productivity goal the soil must be enriched with organic matter and mineral nutrient through development and adoption of appropriate agronomic management practices. Among the various agronomic practices, use of organic manure like compost could increase the fertility status of soil as well as crop yield. *Sesbania rostrata*, *Mimosa invisa* and water hyacinth are legume and non-legume crops in Bangladesh, can be used for the preparation of quality compost. These can be used in the soil for increasing the organic matter status and thus able to nourish the subsequent crop. Thus compost obtained from these sources may be used for lentil production with less cost without deteriorating in soil health. The study on growing pulse crop with compost is limited.

In circumstances, the present study was under taken to formulate an input package with source and rate of compost. So, that it will be technically effective and feasible, economically viable, socially acceptable and environment friendly for lentil production.

Materials and Methods

The experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh, during the period from November 2006 to March 2007.The land was medium high having sandy loam texture soil belongs to Sonatala series under the non-calcareous dark grey floodplain soil type with soil p^H 6.70 (UNDP and FAO, 1988).The soil is low in organic matter content and its general fertility level is low. Treatment included two factors in the experiment. They were:

Factor A. Source of compost
- i) Dhaincha *(Sesbania rostrata)*
- ii) Water hyacinth (*Eichhornia crassipes*)
- iii) Farm compost

Factor B. Rate of compost
- i) 5 t ha^{-1}
- ii) 10 t ha^{-1}
- iii) 15 t ha^{-1}
- iv) 20 t ha^{-1}

The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The unit plot size was 5 m^2 (2.5 m × 2.0 m). Only one variety of pulse crops lentil, variety- BINA Masur 2 was included as experimental crop. No chemical fertilizer was applied in the experimental plots during crop growth period. Compost materials were collected from the Agronomy Field Laboratory, Bangladesh

Agricultural University, Mymensingh. Compost was applied @ 5, 10, 15 and 20 t ha^{-1} as basal and mixed with the soil by spading prior to the final land preparation. Sample of compost from different sources such as compost prepared from *S. rostrata*, water hyacinth and farm compost were collected for chemical analysis before application. Chemical composition of compost are *S. rostrata*, water hyacinth and farm compost contained 1.736, 1.176 and 0.896 percent of N; 0.949, 0.119 and 0.278 percent of P; 0.565, 0.565 and 1.284 percent of K and 0.197, 0.169 and 0.171 percent of S, respectively. The seeds with 92 percent germination capacity were sown in lines continuously at a 25 cm row spacing at the seed rate of 44 kg ha^{-1}. The crop was grown in rainfed condition and seeds were sown in line uniformly. No thinning was required and plant protection measure was taken against root rot disease during the growing period of lentil by sprayed Cufravit @ 50 g 10^{-1} liter of water. Weed was controlled three times due to heavy infestation of weeds. At full maturity, five sample plants were uprooted for data collection from each plot. Grain and straw yields were recorded through whole plot harvesting. The collected data were compiled and tabulated in proper form subjected to statistical analysis. Data were analyzed using the analysis of variance (ANOVA) technique with the help of computer package programme MSTAT-C and mean differences were adjudged by Dunkun's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

Results and Discussion

Effect of source of compost:

Source of compost exerted significant effect on plant population, number branches $plant^{-1}$, number of filled pods $plant^{-1}$, number of sterile pods $plant^{-1}$, number of total pods $plant^{-1}$, number of seeds $plant^{-1}$, 1000-seed weight and seed yield. While plant height, number of seeds pod^{-1}, straw yield, biological yield and harvest index were found insignificant. The highest number (12.39) of branches $plant^{-1}$, number (115.10) of filled pods $plant^{-1}$, number (162.80) of seeds $plant^{-1}$, 1000-seed weight (16.71 g) and seed yield (0.81 t ha^{-1}) were recorded in *S. rostrata* compost treatment (Table 1). The lowest seed yield (0.79 t ha^{-1}), straw yield (2.30 t ha^{-1}) and 1000 seed weight (16.09 g) were found in the farm compost. The *S. rostrata* compost was superior to other compost studied in respect of yield and same of the yield components.

Effect of rate of compost:

Rate of compost had a significant effect on the crop characters of lentil except number of seeds pod^{-1}, 1000-seed weight and harvest index. Number of plant population m^{-2} (195.30), plant height (34.06 cm), number (13.0) of branches $plant^{-1}$, number (116.75) of filled pods $plant^{-1}$, number (1.42) of seeds pod^{-1}, number (168.38) of seeds $plant^{-1}$, 1000-seed weight (16.63 g), seed yield (0.90 t ha^{-1}), straw yield (2.55 t ha^{-1}), biological yield (3.45 t ha^{-1}) and harvest index (25.99%) were highest in the highest the rate of compost (20 t ha^{-1}) and these were lowest in the lowest compost rate (5 t ha^{-1}). The height compost rate (20 t ha^{-1}) was found the best for lentil production in terms of seed yield (Table 2).

Interaction effect between source and rate of compost:

The interaction effect between source and rate of compost on the plant population, number of branches $plant^{-1}$, number of filled pods $plant^{-1}$, number of sterile pods $plant^{-1}$, number of total pods $plant^{-1}$, number of seeds $plant^{-1}$ and seed yield (t ha^{-1}) were significant. On the other hand, plant height, number of seeds pod^{-1}, 1000-seed weight (g), straw yield (t ha^{-1}), biological yield (t ha^{-1}) and harvest index (%) did not vary any significantly due to the interaction of source and rate of compost. The highest seed yield (0.96 t ha^{-1}) was obtained from *S. rostrata* with 20t compost ha^{-1} (Table 3).

From the results of the present study, it may be concluded that the performance of *S. rostrata* compost was better to others (water hyacinth and farm compost) for lentil cultivation. Compost prepared from *S. rostrata* appeared to be the best source and adjustable for cultivation of lentil BINA Masur 2. Again, the result indicates that the seed yield increased with the increased amount of applied compost irrespective of sources of compost. However, lentil BINA Masur 2 may be grown with 20 t ha^{-1} of *S. rostrata* compost for optimum seed yield.

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Table 1. Effect of source of compost treatments on crop characters of lentil.

Source of compost	Plant population (m^{-2})	Plant height (cm)	No. of braches $plant^{-1}$	No. of filled pods $plant^{-1}$	No. of sterile pods $plant^{-1}$	No. of total pods $plant^{-1}$	No. of seeds pod^{-1}	No. of seeds $plant^{-1}$	Seed yield (t ha^{-1})	Straw yield (t ha^{-1})	1000 seeds weight (g)	Biological yield (t ha^{-1})	Harvest index (%)
T_1	176.10a	32.20	12.39a	115.10a	2.19c	117.30a	1.39	162.80a	0.81a	2.35	16.71a	3.16	25.73
T_2	164.10b	33.00	12.18a	105.70b	2.46b	108.16b	1.35	145.90b	0.80b	2.34	16.48a	3.14	25.53
T_3	162.50b	32.96	11.50b	100.60c	3.04a	103.64c	1.35	139.40c	0.79b	2.30	16.09b	3.09	25.52
Level of significance	**	NS	**	**	**	**	NS	**	**	NS	**	NS	NS
$\overline{S}\overline{X}$	1.035	-	0.112	1.055	0.042	1.239	-	0.865	0.004	-	0.101	-	-
CV%	4.14	4.89	4.24	4.41	5.84	6.90	3.96	4.01	4.45	6.06	4.15	5.82	3.71

Table 2. Effect of rate of compost treatments on crop characters of lentil.

Rate of compost (t ha^{-1})	Plant population (m^{-2})	Plant height (cm)	No. of braches $plant^{-1}$	No. of filled pods $plant^{-1}$	No. of sterile pods $plant^{-1}$	No. of total pods $plant^{-1}$	No. of seeds pod^{-1}	No. of seeds $plant^{-1}$	Seed yield (t ha^{-1})	Straw yield (t ha^{-1})	1000 seeds weight (g)	Biological yield (t ha^{-1})	Harvest index (%)
C_1	134.00d	31.47b	10.84d	95.73d	3.10a	98.86d	1.33	131.62d	0.71d	2.11c	16.19	2.82d	25.30
C_2	156.10c	32.84ab	11.70c	104.36c	2.72b	108.10c	1.35	144.55c	0.77c	2.27b	16.36	3.04c	25.43
C_3	184.70b	33.84a	12.52b	111.73b	2.38c	114.10b	1.34	152.73b	0.82b	2.39b	16.50	3.22b	25.64
C_4	195.30a	34.06a	13.00a	116.75a	2.04d	118.80a	1.42	168.38a	0.90a	2.55a	16.63	3.45a	25.99
Level of significance	**	*	**	**	**	**	NS	**	**	**	NS	**	NS
$\overline{S}\overline{X}$	1.195	0.538	0.130	1.219	0.145	1.431	-	0.999	0.0048	0.047	-	0.060	-
CV%	4.14	4.89	4.24	4.41	5.84	6.90	3.96	4.01	4.45	6.06	4.15	5.82	3.71

In a column, figures with same letters do not differ significantly (as per DMRT)**,** * Significant at 5% level, ** Significant at 1% level, NS = Not significant, CV = Coefficient of variation

Table 3. Interaction effect of source and rate of compost on crop characters of lentil.

Interaction bet^{n} source & rate of compost	Plant population (m^{-2})	Plant height (cm)	No. of braches $plant^{-1}$	No. of filled pods $plant^{-1}$	No. of sterile pods $plant^{-1}$	No. of total pods $plant^{-1}$	No. of seeds pod^{-1}	No. of seeds $plant^{-1}$	Seed yield (t ha^{-1})	Straw yield (t ha^{-1})	1000 seeds weight (g)	Biological yield (tha^{-1})	Harvest index (%)
T_1C_1	144.30g	31.53	11.36fg	103.30f	2.60d	105.90ef	1.35	142.43f	0.71e	2.11	16.50	2.82	25.28
T_1C_2	164.00e	32.80	12.03df	115.40bd	2.50de	117.90ac	1.34	157.13c	0.76d	2.21	16.50	2.97	25.55
T_1C_3	189.30bc	34.06	11.83ac	119.30ab	1.96g	121.30ab	1.35	164.33b	0.82c	2.38	16.79	3.20	25.81
T_1C_4	206.60a	34.40	13.33a	122.30a	1.70h	124.00a	1.50	186.53a	0.96a	2.70	16.88	3.66	26.27
T_2C_1	129.60h	31.63	11.23g	93.17g	3.13bc	96.30g	1.32	127.46h	0.71e	2.10	16.18	2.81	25.26
T_2C_2	148.00g	32.53	11.73eg	104.67f	2.33ef	107.00de	1.33	142.33f	0.81c	2.33	16.40	3.14	25.79
T_2C_3	186.00c	33.83	12.60bd	109.10df	2.26ef	111.30ce	1.33	148.36f	0.82c	2.42	16.55	3.25	25.45
T_2C_4	192.60b	34.03	13.16ab	116.00ac	2.10fg	118.10ac	1.40	165.50de	0.86b	2.51	16.79	3.37	25.60
T_3C_1	128.00h	31.26	9.93h	90.70g	3.56a	94.30g	1.33	124.96b	0.72e	2.12	15.90	2.84	25.35
T_3C_2	156.30f	33.20	11.33fg	96.00g	3.33ab	99.33fg	1.34	133.80h	0.75d	2.27	16.04	3.01	24.95
T_3C_3	179.00d	33.63	12.13ce	106.70ef	2.93c	109.70de	1.33	145.50g	0.82c	2.39	16.17	3.21	25.66
T_3C_4	186.60bc	33.76	11.60bd	111.80ce	2.33df	114.13bd	1.34	153.13ef	0.86b	2.45	16.23	3.31	26.11
Level of significance	**	NS	*	*	**	*	NS	**	**	NS	NS	NS	NS
$\bar{S}\bar{X}$	2.07	-	0.225	2.111	0.085	2.479	-	1.731	0.008	-	-	-	-
CV%	4.14	4.89	4.24	4.41	5.84	6.90	3.96	4.01	4.45	6.06	4.15	5.82	3.71

In a column, figures with same letters do not differ significantly (as per DMRT), * Significant at 5% level, ** Significant at 1% level, NS = Not significant, CV = Coefficient of variation