

Effect of different sources of nitrogen on growth and yield of two lines of garlic under dry land condition at BAU, Mymensingh

M.S. Alam, M.A. Rahim and P.W. Simon¹

Department of Horticulture, Bangladesh Agricultural University, Mymensingh, ¹Department of Horticulture, University of Wisconsin, Madison, USA

Abstract: The experiment was carried out to find the effect of different sources of nitrogen on growth and yield of two lines of garlic under dry land condition at BAU, Mymensingh during 2005 to 2006. The 2-factor experiment had 4 sources of nitrogen: i) Urea - 200 kg/ha (30 g/plot) = 92 kg N/ha, ii) Urea -100 kg/ha (15 g/plot) + DAP-200 kg/ha (30 g/plot) = 92 kg N/ha, iii) Diammonium phosphate - 400 kg/ha (60 g/plot) = 92 kg N/ha, iv) Cowdung -7666 kg/ha (1.15 kg/plot) = 92 kg N/ha and 2 garlic lines: G₂ and G₁₉. The two-factor experiment was conducted in randomized complete block design (RCBD) with 3 replications. Yield and yield contributing characters were found to be maximum in garlic lines G₁₉. The highest yield (14.14t/ha) was obtained from garlic line G₁₉ followed by garlic line G₂ (11.16 t/ha). Different sources of nitrogen had significance influence on all the mentioned parameters. Higher yield was also recorded from 7666 kg/ha cowdung (13.50t/ha) than that of 100 kg/ha urea + 200 kg/ha diammonium phosphate (12.85t/ha), 400 kg/ha diammonium phosphate (12.42) and 200 kg/ha urea (11.82 t/ha) ones. The combined effect of garlic lines and different sources of nitrogen revealed significant variation in bulb yield and various yield components. The treatment combination of garlic line G₁₉ and use of 7666 kg/ha cowdung produced the highest yield (15.09 t/ha) and the treatment combination of garlic line G₂ and 200 kg/ha urea gave the lowest yield (10.40 t/ha).

Key words: Sources of nitrogen, growth, yield, garlic.

Introduction

Little attention has so far been given to the improvement of this crop either through selection, hybridization or introduction of suitable variety in this country. Use of high yielding variety is the most important consideration for cultivation of any crop. There was no recommended variety of garlic in Bangladesh before 2005. In Bangladesh, there are many cultivated types of garlic, which are known either by their local or the locality where grown or characteristics of the crop. For the development of suitable varieties of garlic, it is essential to evaluate the characters of the available germplasm properly and conserve the collected materials for future use. Hence, the genetic information on yield and yield contributing characters of the crop species are properly assessed for its improvement. Evaluation and characterization provide a rapid, reliable and efficient too of information to augment the utilization of germplasm. The physical, chemical and biological properties of soil are greatly influenced by organic matter. Although, organic matter contains all the essential plant nutrients, but after application of organic manure requires time to convert into available form of nutrients to the plant. That is why; the response of crops to organic manures is low. But due to the residual and beneficial effects on soil properties, application of organic manures is encouraged. The approximation confirmed that high photosynthetic accumulation occurs in the leaves of garlic fertilized with high N, which is later translocated to the cloves formed in axils resulting in large clove size. So sources of nitrogen are an important factor's for higher yield of garlic. In the above context, effect of different sources of nitrogen on growth and yield of two lines of garlic under dry land condition at BAU, Mymensingh was undertaken to find out the best source of N for garlic.

Materials and Methods

The experiment was carried out to find the effect of different sources of nitrogen on growth and yield of two lines of garlic under dry land condition at BAU, Mymensingh from October, 2005 to April 2006 at the Allium Field Laboratory, Horticulture Farm, Department of Horticulture, Bangladesh Agricultural University,

Mymensingh. The 2-factor experiment had 4 sources of nitrogen : i) Urea - 200 kg/ ha (30 g/plot) = 92 kg N/ha, ii) Urea -100 kg/ha (15 g/plot) + DAP-200 kg/ha (30 g/plot) = 92 kg N/ha, iii) Diammonium phosphate - 400 kg/ha (60 g/plot) = 92 kg N/ha, and iv) Cowdung -7666 kg/ha (1.15 kg/plot) = 92 kg N/ha (BARC, 2005) and 2 Garlic lines: i) G₂ and ii) G₁₉. Unit plot size: 1.5m × 1m, plant spacing: 20 cm × 10 cm ,total number of treatments: 4×2=8, total number of unit plot: 8×3= 24, total number of plants per plot = 75, date of planting: 9 Nov, 2005, date of harvesting: 2 April, 2006. The two-factor experiment was conducted in randomized complete block design (RCBD) with 3 replications. Intercultural operation were done as and when necessary. Data were recorded on yield and yield contributing characters on height of plant, no. of leaves per plant, fresh weight of bulb diameter of bulb, length of bulb, no. of cloves per bulb, yield of bulb per plot and yield of bulb per hectare. The difference between the treatment means was judged by Least Significance Test (LSD).

Results and Discussion

Effect of garlic lines: Garlic lines showed significant influence on height of plant and no. of leaves per plant at different days after planting and fresh weight of bulb, diameter and length of bulb, no. of cloves per bulb, yield of bulb per plot and yield of bulb per hectare at harvest. Height of plant and no. of leaves per plant were taken 30, 60, 90, 120 and 135 days after planting (DAP). The tallest plant (69.25cm), no of leaves per plant (7.80) (Table 1), fresh weight of bulb (29.05g), diameter (3.72 cm) and length (3.82cm) of bulb, no. of cloves per bulb (24.72), yield of bulb per plot (2.12kg) and yield of bulb per hectare (14.14 t/ha) were obtained from the plots in garlic line G₁₉. Height of plant and no. of leaves per plant increased with the time from 30 to 120 days after planting and then it reduced due to senescence while the lowest values of all the above mentioned parameters were found in garlic line G₂. When yield was considered, garlic line G₁₉ produced the highest amount (14.14 t/ha) while the lowest (11.16t/ha) was obtained from garlic line G₂ (Table 2). This might be due to the fact that germplasm G₁₉ had a

good genetic potential which enhanced more cell division and cell elongation resulting best performance. These results are in agreement with Rahman *et al.*, (2005), Islam *et al.* (2004), Azad (2002) and Halim (2000). They also stated that the most promising cultivars (G₂ and G₁₉) in terms of yield potential. Garlic lines G₁₉ performed better than garlic line G₂ with respect to yield and yield

contributing characters. The best performance in garlic line G₁₉ was possibly due to more deposition of photosynthates during vegetative growth of plant which probably led to the development of longer bulbs. This finding agrees with the reports of Singh *et al.* (2002), and Shamim (2001) who stated that garlic line was termed to be the most promising cultivars in terms of yield potential.

Table 1. Effect of garlic lines on height of plant and number of leaves per plant under dry land condition at different days after planting (BAU, Mymensingh)

Treatments	Height of plant in cm at DAP					No. of leaves/plant at DAP				
	30	60	90	120	135	30	60	90	120	135
G ₁₉	30.45	41.20	59.25	69.25	57.02	4.97	5.60	7.27	7.80	7.17
G ₂	22.60	36.52	54.12	64.12	51.57	4.55	5.00	6.85	7.30	6.82
Level of sig.	**	**	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability

Table 2. Effect of garlic lines on growth and yield of garlic bulb under dry land condition at harvest (BAU, Mymensingh)

Treatments	Fresh wt. of bulb (g)	Length of bulb (cm)	Diameter of bulb (cm)	No. of cloves/bulb	Yield/plot (kg)	Yield (t/ha)
G ₁₉	29.05	3.82	3.72	24.72	2.12	14.14
G ₂	25.75	3.45	3.37	22.67	1.67	11.16
Level of sign.	**	NS	NS	NS	**	**

* = Significant at 5% level of probability, ** = Significant at 1% level of probability, NS = Non significant,

Table 3. Effect of sources of nitrogen on height of plant and number of leaves per plant of garlic under dry land condition at different days after planting (BAU, Mymensingh)

Treatments	Height of plant in cm at DAP					No. of leaves/plant at DAP				
	30	60	90	120	135	30	60	90	120	135
T ₁	29.50	42.40	60.20	70.20	57.15	5.25	5.80	7.45	8.10	7.48
T ₂	27.10	39.90	57.25	67.25	54.80	4.85	5.35	7.25	7.70	7.13
T ₃	25.90	38.05	55.90	65.90	53.45	4.60	5.10	6.95	7.40	6.83
T ₄	23.60	35.10	53.40	63.40	51.80	4.35	4.95	6.60	7.00	6.53
Level of sig.	**	**	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability, T₁ = 7666 kg/ha cowdung, T₂ = 100 kg/ha urea + 200 kg/ha diammonium phosphate, T₃ = 400 kg/ha diammonium phosphate T₄ = 200 kg/ha urea

Table 4. Effect of sources of nitrogen on growth and yield of garlic bulb under dry land condition at harvest (BAU, Mymensingh)

Treatments	Fresh wt. of bulb (g)	Length of bulb (cm)	Diameter of bulb (cm)	No. of cloves/bulb	Yield/plot (kg)	Yield (t/ha)
T ₁	29.25	4.10	4.00	28.10	2.02	13.50
T ₂	27.85	3.75	3.75	25.05	1.93	12.85
T ₃	26.90	3.45	3.35	22.30	1.86	12.42
T ₄	25.60	3.25	3.10	19.35	1.77	11.82
Level of sig.	**	NS	NS	**	**	**

** = Significant at 1% level of probability, NS = Non significant, T₁ = 7666 kg/ha cowdung, T₂ = 100 kg/ha urea + 200 kg/ha diammonium phosphate, T₃ = 400 kg/ha diammonium phosphate T₄ = 200 kg/ha urea

Table 5. Combined effect of garlic lines and sources of nitrogen on height of plant and number of leaves per plant under dry land condition at different days after planting (BAU, Mymensingh)

Treatment combination	Height of plant in cm at DAP					No. of leaves/plant at DAP				
	30	60	90	120	135	30	60	90	120	135
V ₁ T ₁	33.00	45.400	63.200	73.20	60.10	5.50	6.00	7.70	8.40	7.70
V ₁ T ₂	31.20	42.60	59.20	69.20	57.20	5.10	5.70	7.50	8.00	7.30
V ₁ T ₃	29.80	40.40	58.40	68.40	56.50	4.80	5.40	7.10	7.60	7.00
V ₁ T ₄	27.80	36.40	56.20	66.20	54.30	4.50	5.30	6.80	7.20	6.70
V ₂ T ₁	26.00	39.40	57.20	67.20	54.20	5.00	5.60	7.20	7.80	7.27
V ₂ T ₂	23.00	37.20	55.30	65.30	52.40	4.60	5.00	7.00	7.40	6.97
V ₂ T ₃	22.00	35.70	53.40	63.40	50.40	4.40	4.80	6.80	7.20	6.67
V ₂ T ₄	19.40	33.80	50.60	60.60	49.30	4.20	4.60	6.40	6.80	6.37
Level of sig.	**	**	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability, V₁ = Garlic line G₁₉, V₂ = Garlic line G₂, T₁ = 7666 kg/ha cowdung, T₂ = 100 kg/ha urea + 200 kg/ha diammonium phosphate, T₃ = 400 kg/ha diammonium phosphate T₄ = 200 kg/ha urea

Table 6. Combined effect of garlic lines and sources of nitrogen on growth and yield of garlic bulb under dry land condition at harvest (BAU, Mymensingh/2004-05, Expt. 3a)

Treatment combination	Fresh wt. of bulb (g)	Length of bulb (cm)	Diameter of bulb (cm)	No. of cloves/bulb	Yield/plot (kg)	Yield (t/ha)
V ₁ T ₁	31.00	4.20	4.10	29.20	2.26	15.09
V ₁ T ₂	29.40	3.90	3.80	26.10	2.15	14.31
V ₁ T ₃	28.60	3.70	3.60	23.20	2.09	13.92
V ₁ T ₄	27.20	3.50	3.40	20.40	1.99	13.24
V ₂ T ₁	27.50	4.00	3.90	27.00	1.79	11.92
V ₂ T ₂	26.30	3.70	3.60	24.00	1.71	11.40
V ₂ T ₃	25.20	3.20	3.10	21.40	1.64	10.92
V ₂ T ₄	24.00	3.00	2.80	18.30	1.56	10.40
Level of sig.	**	*	**	**	**	**

** = Significant at 1% level of probability, V₁ = Garlic line G₁₉, V₂ = Garlic line G₂, T₁ = 7666 kg/ha cowdung, T₂ = 100 kg/ha urea + 200 kg/ha diammonium phosphate, T₃ = 400 kg/ha diammonium phosphate T₄ = 200 kg/ha urea

Effect sources of nitrogen: The sources of nitrogen had significant influence on all the parameters studied. The tallest plant (70.20cm), number of leaves per plant (8.10) (Table 3), bulb diameter (4.00cm) and length (4.10 cm), fresh weight of bulb (29.25g), no of cloves per bulb (28.10), yield per plot (2.02kg) and yield per hectare (13.50t/ha) (Table 4) were found in 7666 kg/ha cowdung, while the lowest values of all the above mentioned parameters were obtained from 200 kg/ha urea. When cowdung is applied in soil, it improves the physical conditions of the soil, making micro nutrient available which help the plant for easy establishment in the field and easy uptake of nutrient slowly at tender stage of the plant. These results partially agree with those of Dixit (1997) who stated those higher yields were obtained with the higher rate of FYM. Katyal (1977) suggested that 15 to 20 ton FYM/ha is appreciable for early growth stage of garlic crop.

Combined effect of garlic lines and seed clove size: A remarkable combined effect was observed between the different sources of nitrogen and different lines of garlic on all the parameters studied different days after planting (Table 5 & 6). The tallest plant (73.20 cm) and the maximum number of leaves (8.40) per plant were found in 7666 kg/ha cowdung with garlic line G₁₉ 120 DAP and the shortest plant (19.40 cm) and minimum numbers of leaves (4.20) were obtained from 200 kg/ha urea with garlic line G₂ 30 DAP (Table 5). The highest fresh weight of bulb per plant (31.00g), length (4.20cm) and diameter (4.10cm) of bulb, number of cloves per bulb (29.20) and yield per

plot (2.26Kg) were obtained from 7666 kg/ha cowdung with garlic lines G₁₉ and the minimum values were found in all the mentioned parameters from 200 kg/ha urea with garlic line G₂ (Table 6). The 7666 kg/ha cowdung with garlic lines G₁₉ gave the highest (15.09 t/ha) yield and the lowest (10.40t/ha) was recorded from 200 kg/ha urea with garlic line G₂.

Cowdung @ 7666 kg/ha (92 kg N/ha) appeared to be the best source of nitrogen for the product of garlic under dry land conditions. The highest yields under dry land (15.09 t/ha) condition were obtained from the germplasm G₁₉ supplied with 7666 kg cowdung per hectare.

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