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## Effect of Planting Dates on the Growth and Yield of Garlic Germplasm

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**Abstract:** An experiment was conducted to performance study of collected germplasm of garlic in different dates of planting at the Horticulture Farm of Bangladesh Agricultural University, Mymensingh during the period from October 1997 to April 1998. The objective of the work was to observe the performance of different local and exotic germplasm of garlic in different dates of planting and to get maximum yield of garlic. There were two planting time viz. October and November 30 and ten germplasm were Natore ( $G_1$ ), Dhaka, Keraniganj ( $G_2$ ), Syedpur ( $G_3$ ), Pabna ( $G_4$ ), Faridpur Tripple clove ( $G_5$ ), Jamalpur ( $G_6$ ), Faridpur Single clove ( $G_7$ ), Kishoreganj ( $G_8$ ), China ( $G_9$ ) and Australia ( $G_{10}$ ) were used as the experimental treatments. The experiment was laid out in Randomized Complete Block Design with three replications. With the delay in planting time from Oct 30 yield was reduced in later plantings. The highest bulb yield ( $8.56 \text{ t ha}^{-1}$ ) was recorded when planting was done on October 30. The lowest yield was obtained from November 30 ( $3.96 \text{ t ha}^{-1}$ ) planting. Germplasm  $G_1$  yielded ( $8.52 \text{ t ha}^{-1}$ ) best followed by  $G_2$  (8.43),  $G_7$  (7.35) and  $G_3$  (7.29), respectively. The lowest yield (4.53) was obtained from Germplasm  $G_8$ . Among 2 exotic germplasm (China and Australia) failed to form bulb. It may be concluded that early planting with local germplasm  $G_1$  and  $G_2$  is the best to get maximum yield of garlic.

**Key words:** Garlic, planting time, germplasm, yield

### Introduction

Garlic (*Allium sativum* L.) is an important crop and used as spices throughout Bangladesh and world also. In Bangladesh the average yield of garlic is  $3.08 \text{ t ha}^{-1}$  (BBS, 1999). It is very low as compared to the countries such as China ( $14.54 \text{ t ha}^{-1}$ ). The requirement of garlic in Bangladesh is about 85000 metric tons (Rahim, 1992). Thus current production is 54.11% less than that of total demand. There is no recommended variety/cultivars of garlic in Bangladesh.

Date of planting influence the growth and yield of garlic. In Bangladesh the crop is generally planted with the onset of winter (Rashid, 1976). The growth period of garlic is centered on the cool season but their life cycle, particularly from late plantings may be extended to the period when high temperature and heavy rainfall prevails which exert unfavorable effects on the growth and development. However, only early-planted crops can utilize full advantages of the available cool period, although farmers in Bangladesh can not always adopt early planting due to climatic limitations and cropping pattern. Farmers normally plant garlic in the month of December. In some parts of Bangladesh, the growers plant garlic in the month of December and January after harvesting of transplanted Aman rice. For this reason, plants are exposed to high temperature before bulb initiation and during the growth and development of bulb in the period from February to April. As a result, bulb production is low and in some cases a percentage of the

plant does not initiate bulbs at all (Rahim *et al.*, 1984).

There is sufficient scope of increasing yield of garlic by using improved varieties at proper time. The local good germplasm, which can be easily planted earlier through changing the existing cropping pattern. As a result the farmers will get more yield per unit area which ultimately makes them economically solvent, on the other hand there is also scope of introducing some of the exotic germplasm which will contribute in the increase of our national production. Considering above facts the present experiment was undertaken to observe the performance of different local and exotic germplasm of garlic in different dates of planting.

### Materials and Methods

The experiment was conducted at the Horticulture Farm of Bangladesh Agricultural University, Mymensingh during October, 1997 to April, 1998 with 2 exotic and 8 local germplasm of garlic planting at two different dates. The experimental planting dates were October 30 and November 30 and ten germplasm were Natore ( $G_1$ ), Dhaka, Keraniganj ( $G_2$ ), Syedpur ( $G_3$ ), Pabna ( $G_4$ ), Faridpur Tripple clove ( $G_5$ ), Jamalpur ( $G_6$ ), Faridpur Single clove ( $G_7$ ), Kishoreganj ( $G_8$ ), China ( $G_9$ ) and Australia ( $G_{10}$ ) collected from different places of Bangladesh and different countries. The experiment was laid out in randomized complete block design (RCBD) with 3 replications. The size of the unit plot was  $6\text{m} \times 1\text{m}$ . Spacing of  $20 \text{ cm} \times 15 \text{ cm}$  accommodating 200 plants in each plot. Data were

recorded on yield and some selected plant characters and statistically analyzed for evaluation of the effects of different treatments and treatment combinations.

**Results and Discussion**

Time of planting had marked influence on the plant height, number of leaves per plant, bulb diameter, fresh weight of bulb, fresh weight of leaves and final yield (Table 1). The highest plant height was recorded from Oct. 30 (44.90 cm) while Nov. 30 plantation produced the lowest plant height

(33.45 cm). Earliest planting gave the highest plant height, probably because the plants received cool temperature and shorter day length which enhanced meristematic elongation of plant. The maximum number of leaves was counted from Oct. 30 (10.54), but Nov. 30 plantation produced the lowest (7.74). This is possibly due to the plant attained higher vegetative growth, as a result the plants gave higher number of leaves. The result is in agreement with the findings of Rahim *et al.*, 1984 and Sultana *et al.*, 1997. Oct. 30 planting gave the largest

Table 1: Effect of planting time on the growth and yield of garlic

Planting time	Plant height (cm) at maximum growth stage	No. of leaves/ plant	Bulb diameter (cm)	Fresh wt. of bulb (g)	Fresh weight of leaf/plant	Yield/plot <sup>a</sup> (kg)	Yieldha <sup>-1</sup> (t)
Oct. 30 (P <sub>1</sub> )	44.90	10.54	2.75	42.98	4.98	6.96	8.56
Nov. 30 (P <sub>2</sub> )	33.45	7.74	2.28	20.67	3.89	3.18	3.96
LSD 5%	0.18	0.17	0.15	3.22	1.10	4.66	2.23
1%	0.22	0.27	0.18	5.16	1.67	6.86	3.86
Level of significance	**	**	**	**	NS	**	**

Table 2: Effect of different germplasm on the growth and yield of garlic

Germplasm	Plant height (cm)	No. of leaves/ plant	Bulb diameter (cm)	Fresh weight/ bulb (g)	Fresh weight of leaves/ plant	Yield/ plot <sup>a</sup> (kg)	Yield ha <sup>-1</sup> (t)
Natore (G <sub>1</sub> )	39.30	9.43	2.61	37.77	4.76	6.33	8.52
Dhaka, Keraniganj (G <sub>2</sub> )	37.55	8.97	2.49	32.10	4.57	6.75	8.43
Sayedpur (G <sub>3</sub> )	37.18	8.83	2.59	35.55	4.41	5.82	7.29
Pabna (G <sub>4</sub> )	40.35	8.15	2.32	29.55	4.48	3.81	4.77
Faridpur, Tripple clove (G <sub>5</sub> )	33.55	7.75	2.51	26.91	2.55	3.96	4.98
Jamalpur (G <sub>6</sub> )	48.82	9.62	2.63	32.97	6.47	4.38	5.46
Faridpur, Single clove (G <sub>7</sub> )	34.03	9.07	2.71	34.50	2.86	5.88	7.35
Kishorganj (G <sub>8</sub> )	42.62	9.27	2.27	27.48	5.02	3.63	4.53
Australia (G <sub>9</sub> )	45.50	8.75	b	b	13.75	b	b
China (G <sub>10</sub> )	46.60	7.76	b	b	8.88	b	b
LSD 5%	0.22	0.35	0.30	4.10	2.27	0.72	2.87
1%	0.32	0.60	0.42	5.74	3.11	1.31	4.32
Level of significance	**	**	**	**	**	**	**

Table 3: Combined effect of planting time and germplasm on the growth and yield of garlic

Germplasm	Plant height (cm)	No. of leaves/ plant	Bulb diameter (cm)	Fresh weight/ bulb (g)	Fresh weight of leaves/ plant	Yield/ plot <sup>a</sup> (kg)	Yield ha <sup>-1</sup> (t)
Oct. (P <sub>1</sub> )	Natore (G <sub>1</sub> )	46.00	10.87	3.10	57.75	6.15	8.40
	Dhaka, Keraniganj (G <sub>2</sub> )	41.20	9.97	2.78	44.61	4.73	11.25
	Syedpur (G <sub>3</sub> )	42.43	10.10	3.06	51.81	5.43	8.64
	Pabna (G <sub>4</sub> ) 44.43	11.60	2.50	39.00	4.48	5.08	6.30
	Faridpur, Tripple clove (G <sub>5</sub> )	36.77	9.00	2.61	32.49	2.32	5.28
	Jamalpur (G <sub>6</sub> )	60.13	13.37	2.90	44.22	7.74	5.91
	Faridpur, Single clove (G <sub>7</sub> )	38.67	9.80	2.72	43.11	2.97	7.20
	Kishorganj (G <sub>8</sub> )	49.77	11.60	2.31	29.16	5.97	4.02
	China (G <sub>9</sub> )	45.03	7.70	b	b	10.67	b
	Australia (G <sub>10</sub> )	48.50	10.30	b	b	8.00	b
Nov. (P <sub>2</sub> )	Natore (G <sub>1</sub> )	32.60	8.00	2.12	27.61	3.37	4.26
	Dhaka, Keraniganj (G <sub>2</sub> )	33.60	7.97	2.19	19.59	4.40	2.22
	Syedpur (G <sub>3</sub> )	32.10	7.57	2.11	19.29	3.38	3.00
	Pabna (G <sub>4</sub> )	36.27	8.70	2.15	20.10	5.20	2.58
	Faridpur, Tripple clove (G <sub>5</sub> )	30.33	6.53	2.42	21.30	2.77	2.64
	Jamalpur (G <sub>6</sub> )	37.50	7.87	2.35	21.69	5.20	2.88
	Faridpur, Single clove (G <sub>7</sub> )	29.40	8.33	2.69	25.89	2.75	4.56
	Kishorganj (G <sub>8</sub> )	35.47	6.93	2.23	19.80	4.07	3.24
	China (G <sub>9</sub> )	30.39	7.20	b	b	9.00	b
	Australia (G <sub>10</sub> )	48.37	7.55	b	b	7.30	b
LSD 5%	0.35	0.62	0.41	7.06	4.10	3.32	1.10
1%	0.49	0.76	0.51	9.33	5.51	4.41	1.47
Level of significance	*	**	NS	NS	NS	NS	NS

a = Unit plot size 6m x 1m

NS = Non significant

\*\* = Significant at 1% level

b = No bulb form in these germplasm

bulbs (2.75 cm) and the lowest (2.28 cm) from Nov. 30. The findings are in agreement with the reports of (Sultana *et al.*, 1997; Islam *et al.*, 1998). They reported that in early planting, plants attained higher vegetative growth, which possibly led to the development of the largest bulbs. Production of small bulbs in the later plantings may be explained by the fact that the plant did not receive a long cool growing period, which was essential for proper development of garlic bulbs as stated by Rahim 1988. The fresh weight of bulb was maximum (42.98 g) at Oct. 30 planting and lowest (20.67 g) at Nov. 30. Earliest (Oct. 25) planting gave the highest bulb weight may be due to plant received cool temperature for longer period which possibly increased the vegetative growth and yield of bulb. Therefore, early grown plants produced large sized bulbs resulting in the increased weight. It was also observed that early plantation produced biggest bulbs and weight and decreased with delayed in planting. These findings are in agreement with the reports of (Rahim *et al.*, 1984; Sultana *et al.*, 1997; Islam *et al.*, 1998). The highest fresh weight of leaves per plant was recorded in Oct. 30 planting (4.98 g). The lowest fresh weight of leaves/plant was obtained from the planting of Nov. 30 planting (3.89 g). The above results agreed with the findings of Sultana *et al.* (1997) and Islam *et al.* (1998). They reported that the early planted crops produced comparatively higher weight of leaves. The highest bulb yield/plot was obtained from Oct. 30 planting (6.96 Kg) and the lowest yield was found from the planting of Nov (3.18 Kg). This result is in agreement with the findings of Siddique and Rabbani (1985). They reported that the reduction in yield was about 33 and 80% when the date of planting was shifted from Oct. 30 to Nov. 30 (Table 1). The highest yield was obtained from Oct. 30 planting (8.56 t ha<sup>-1</sup>). The lowest yield was obtained from the planting of Nov. 30 planting (3.96). The higher yield obtained from the early planting was probably due to the production of large bulb. In early planting, plants attained higher vegetative growth which possibly led to the development of larger bulb and higher yield. Late planting produced smaller bulbs and lower yield which may be explained in a way that the plants did not get a long cool growing period which was essential for proper development of vegetative growth for garlic (Rahim, 1988).

Different germplasm showed remarkable variations on their effect on plant height, number of leaves per plant, bulb diameter, fresh weight of bulb, fresh weight of leaves per plant, and yield of garlic which are presented in Table 2. Plant height of different garlic germplasm varied significantly from each other. Among the local germplasm the highest plant height (48.82 cm) was obtained from G<sub>6</sub> and the lowest plant height (33.55 cm) was found in G<sub>5</sub>.

Among 2 exotic germplasm G<sub>10</sub> showed the highest plant height (46.60 cm). This may be due to varying germplasm characters. The highest number of leaves (9.62) were obtained from G<sub>6</sub> and the lowest number of green leaves (7.75) was obtained from G<sub>5</sub>. Different germplasm showed highly significant effect in case of bulb diameter, except 2 exotic germplasm (G<sub>9</sub> and G<sub>10</sub>) were no bulb formed (Table 2) due to high temperature and short day length. But tropical cultivars formed bulbs in any day length (8 -16 h) as reported by Rahim (1988). He also added that when day length increases crop duration decreases, consequently yield of bulb decreases. G<sub>7</sub> gave the highest bulb diameter (2.71 cm) than G<sub>3</sub> (2.27 cm). The individual bulb weight was taken at the time of harvesting. Significant variation of bulb weight of different germplasm was also observed. The highest bulb weight (37.77 g) was recorded in G<sub>1</sub>. The lowest bulb weight (26.91 g) was recorded from G<sub>5</sub>. Exotic germplasm of G<sub>9</sub> gave the highest fresh weight of leaves (13.75 g). On the other hand, among the local germplasm, G<sub>1</sub> and G<sub>5</sub> produced the highest (4.76 g) and the lowest (2.55 g) fresh weight of leaves, respectively. All exotic germplasm performed better than that of local germplasm. This result may be due to variation of germplasm characters. Highly significant result was observed in case of bulb yield per plot. G<sub>2</sub> gave the highest yield (6.75 kg) and the lowest (3.63 Kg) yield was observed from G<sub>8</sub>. The highest yield (8.52 t ha<sup>-1</sup>) was found from G<sub>1</sub> and the lowest (4.53 t ha<sup>-1</sup>) from the germplasm of G<sub>8</sub>.

Combined effect of date of planting and germplasm showed insignificant effect except plant height and number of leaves/plant (Table 3). Exotic germplasm G<sub>10</sub> showed the highest plant height than local germplasm in both plantings (Table 3). Germplasm G<sub>6</sub> produced the highest number of green leaves per plant in both planting. The highest bulb diameter (3.10 cm) was observed from germplasm G<sub>1</sub> in October 30 planting and the lowest (2.11 cm) from G<sub>3</sub> in November 30 planting. The highest fresh weight of bulb (57.75 g) was recorded from the germplasm G<sub>1</sub> in October 30 planting and the lowest (19.29 g) from G<sub>3</sub> in November 30 planting. Germplasm G<sub>2</sub> gave the highest yield (11.25 kg) per plot and the lowest yield (2.22 kg) was recorded from G<sub>2</sub> in November 30 plantation. The highest yield (14.07 t ha<sup>-1</sup>) was recorded from the germplasm G<sub>2</sub> in October 30 planting and the lowest (2.79 t ha<sup>-1</sup>) from G<sub>2</sub> in November 30 planting (Table 3).

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