

Performance evaluation of garlic germplasms under dry land condition

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Abstract The present research was carried out at the Alliums Field Laboratory, Horticulture Farm and laboratory of the BAU-Germplasm Centre, Department of Horticulture, Bangladesh Agricultural University, Mymensingh, during the period from September 2003 to April 2004 to assess the performances of 20 selected garlic germplasm under dry land condition. The single-factor experiment was conducted in randomized complete block design (RCBD) with 3 replications.. The results revealed that the plant height, number of leaves per plant, fresh and dry weight of bulb, length and diameter of bulb, total number of cloves, yield per plot and yield per hectare were significantly influenced by the treatment of the experiments under study. Results showed that among different germplasm, germplasm G₁₉ was the best for yield and other yield related parameters.

Key words: Garlic, germplasm, dry land condition

Introduction

Evaluation and documentation are important for exploitation of genetic variability for sustainable human benefits. According to Singh (2003), evaluation may consist for nothing more than description of the place of origin and a morphological and phenological description of the places of origin or it may consist of information on physiological, biochemical, genetical, plant pathological or other characteristics. Evaluation and characterization provide a rapid, reliable and efficient too of information to augment the utilization of germplasm. 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. Variability is a touch-stone to the breeders to evolve high yielding varieties through selection, either from the existing genotypes or from the segregates of a cross. Hence, the genetic information on yield and yield contributing characters of the crop species need to be properly assessed for its improvement. This is difficult to know what proportion of the observed variability is for genetic effect. On the other hand, duplication of germplasm should be avoided for mid or long term conservation of the collected germplasm. For a rapid and efficient plant breeding programme, knowledge of relationship among the yield and yield contributing character is necessary. In the above context, performance of selected germplasm was evaluated for its conservation and cultivation in Bangladesh condition.

Materials and Methods

The experiment was carried out at the Allium Field Laboratory and Laboratory of the BAU-Germplasm Centre, Horticulture Farm, Bangladesh Agricultural University, Mymensingh during September 2003 to April 2004. The single-factor experiment was conducted in randomized complete block design (RCBD) with 3 replications. Twelve accessions of garlic two from each location viz. Nilphamari (G₁ & G₂), Dinajpur (G₃ & G₄), Ishurdi (G₅ & G₆), Magura (G₇ & G₈), Meherpur (G₉ & G₁₀) and Mymensingh (G₁₁ & G₁₂) district, four accessions (G₁₃ to G₁₆) from different research institute of Bangladesh and four accessions (G₁₇ to G₂₀) collected from India were used as the planting materials. The selected 20 garlic germplasm were considered as the treatments of the experiment. Details of experiment Unit plot size: 37 m × 1m ; Plant spacing: 20 cm × 10 cm; Total number of unit plots: 20 × 3 = 60; Total number of plants per plot = 1850;

Date of planting: 9 Nov, 2003; Date of harvesting: 30 March, 2004. Data were recorded on i) Height of plant ii) No. of leaves per plant iii) Fresh weight of leaves per plant iv) Fresh weight of bulb v) Fresh weight of roots per plant vi) Dry weight of leaves per plant vii) Dry weight of bulb viii) Dry weight of roots per plant ix) Diameter of bulb x) Length of bulb xi) No. of cloves per bulb xii) Yield of bulb per plot and xiii) Yield of bulb per hectare.

Results and Discussion

Remarkable variations were observed due to the effect of different germplasm on height of plant, number of leaves, number of cloves per bulb, length, diameter of bulb, yield per plot and yield of garlic during the growth period as well as at final harvest.

Height of plant: Height of plant was taken 30, 60, 90, 120 and 135 days after planting (DAP). Germplasm showed highly significant variations in respect of height of plant 30, 60, 90, 120 and 135 days after planting. Up to 120 days after planting, different germplasm showed increasing trend in height of plant and thereafter declined. It was observed that germplasm G₁₉ produced the tallest plant (90.00 cm) 120 days after planting followed by G₂ (84.66 cm), G₁₃ (76.00 cm), G₁₀ (75.37 cm), G₂₀ (75.66 cm) and G₃ (74.66 cm), respectively. The shortest plant was found in germplasm G₁₈ (22.30 cm) 30 days after planting (Table 1).

Number of leaves per plant: There were significant differences in number of leaves per plant at different days after planting (Appendix IVa). The highest number of leaves (11.50) was obtained from germplasm G₁₉ 120 days after planting and the lowest number of leaves (4.08) was recorded from germplasm G₁₈ 30 days after planting (Table 1).

Fresh weight of bulb at harvest: Different germplasm showed highly significant variations in respect of fresh weight of bulb (Appendix IVa). The result indicates that germplasm G₁₉ gave the highest (41.86g) fresh weight of bulb followed by G₂ (31.03g). The lowest fresh weight of bulb (8.13g) was recorded from germplasm G₁₈ at harvest (Table 2).

Length of bulb at harvest: Significant variation was observed among the germplasms in respect of length of bulb at harvest (Appendix IVa). The highest length of bulb was recorded in germplasm G₁₉ (4.55 cm) followed by germplasm G₂ (4.35 cm) and the lowest (3.07 cm) was obtained in germplasm G₁₈ (Table 2).

Table 1. Height of plant and number of leaves per plant of 20 garlic germplasm at different days after planting.

| Germplasm | Height of plant in cm at DAP | | | | | No. of leaves/plant at DAP | | | | |
|-----------------|------------------------------|-------|-------|-------|-------|----------------------------|------|-------|-------|------|
| | 30 | 60 | 90 | 120 | 135 | 30 | 60 | 90 | 120 | 135 |
| G ₁ | 27.70 | 40.19 | 60.11 | 72.67 | 53.00 | 4.62 | 5.52 | 7.69 | 8.00 | 6.52 |
| G ₂ | 34.65 | 50.17 | 70.99 | 84.66 | 72.00 | 4.25 | 5.75 | 10.17 | 11.27 | 9.50 |
| G ₃ | 30.78 | 44.40 | 66.33 | 74.66 | 68.66 | 4.37 | 5.51 | 8.52 | 10.83 | 9.25 |
| G ₄ | 25.66 | 42.47 | 68.22 | 72.21 | 60.00 | 4.44 | 5.88 | 9.11 | 9.42 | 9.00 |
| G ₅ | 30.27 | 41.19 | 69.42 | 75.22 | 63.00 | 4.19 | 5.69 | 8.44 | 9.25 | 8.08 |
| G ₆ | 29.83 | 45.61 | 65.13 | 72.33 | 64.33 | 4.72 | 6.03 | 8.25 | 9.00 | 7.92 |
| G ₇ | 28.50 | 40.58 | 66.58 | 71.66 | 68.00 | 4.41 | 6.18 | 9.97 | 10.25 | 9.08 |
| G ₈ | 28.58 | 41.92 | 65.97 | 73.22 | 67.00 | 4.80 | 5.94 | 8.17 | 8.75 | 7.25 |
| G ₉ | 27.80 | 42.34 | 69.62 | 72.00 | 66.33 | 4.61 | 5.94 | 9.25 | 9.75 | 8.92 |
| G ₁₀ | 31.33 | 46.52 | 71.89 | 75.37 | 64.00 | 4.25 | 6.30 | 8.11 | 10.58 | 9.50 |
| G ₁₁ | 28.34 | 36.42 | 58.19 | 73.66 | 60.11 | 4.42 | 5.91 | 7.64 | 8.00 | 7.17 |
| G ₁₂ | 28.66 | 43.68 | 45.45 | 50.00 | 48.67 | 5.67 | 6.10 | 8.83 | 9.42 | 7.67 |
| G ₁₃ | 31.00 | 43.17 | 70.43 | 76.00 | 63.00 | 4.64 | 6.14 | 7.47 | 7.50 | 6.75 |
| G ₁₄ | 29.23 | 45.67 | 47.67 | 65.33 | 53.00 | 5.50 | 8.07 | 6.50 | 9.50 | 8.17 |
| G ₁₅ | 23.45 | 34.98 | 50.25 | 73.00 | 62.00 | 4.17 | 4.86 | 6.19 | 7.25 | 6.00 |
| G ₁₆ | 31.69 | 44.47 | 53.17 | 62.00 | 51.67 | 5.55 | 6.53 | 7.77 | 8.50 | 7.50 |
| G ₁₇ | 27.00 | 31.00 | 36.04 | 56.66 | 49.00 | 4.12 | 5.30 | 6.36 | 7.00 | 6.33 |
| G ₁₈ | 22.30 | 29.11 | 33.30 | 53.00 | 45.00 | 4.08 | 4.36 | 6.28 | 7.25 | 6.17 |
| G ₁₉ | 36.20 | 51.27 | 76.34 | 90.00 | 75.33 | 4.63 | 4.25 | 10.57 | 11.50 | 9.93 |
| G ₂₀ | 30.36 | 48.62 | 68.76 | 75.66 | 67.00 | 4.46 | 7.08 | 8.94 | 9.25 | 8.75 |
| LSD 1% | 4.19 | 5.09 | 5.59 | 19.08 | 5.71 | 0.64 | 1.85 | 2.60 | 0.76 | 0.63 |

Table 2. Growth and yield of bulbs of selected 20 garlic germplasm at harvest

| Germplasm | Fresh wt. of bulb (g) | Length of bulb (cm) | Diameter of bulb (cm) | No. of cloves/bulb | Yield/plot (kg) |
|-----------------|-----------------------|---------------------|-----------------------|--------------------|-----------------|
| G ₁ | 20.61 | 3.37 | 3.35 | 30.200 | 37.10 |
| G ₂ | 31.03 | 4.35 | 4.32 | 32.96 | 57.09 |
| G ₃ | 22.73 | 3.81 | 3.78 | 31.93 | 40.91 |
| G ₄ | 20.13 | 3.62 | 2.95 | 27.97 | 37.14 |
| G ₅ | 21.17 | 3.52 | 3.40 | 21.00 | 38.10 |
| G ₆ | 20.60 | 3.16 | 3.32 | 31.47 | 37.49 |
| G ₇ | 20.11 | 3.46 | 3.39 | 24.00 | 37.10 |
| G ₈ | 20.34 | 3.51 | 3.50 | 31.40 | 37.43 |
| G ₉ | 20.36 | 3.59 | 3.56 | 30.40 | 37.36 |
| G ₁₀ | 23.20 | 3.42 | 3.40 | 29.13 | 42.22 |
| G ₁₁ | 20.76 | 3.38 | 3.37 | 31.00 | 38.20 |
| G ₁₂ | 10.49 | 3.48 | 3.36 | 0.00 | 19.30 |
| G ₁₃ | 20.00 | 3.64 | 3.50 | 24.47 | 37.00 |
| G ₁₄ | 14.49 | 3.17 | 3.33 | 0.00 | 26.08 |
| G ₁₅ | 20.83 | 3.59 | 3.58 | 15.73 | 37.70 |
| G ₁₆ | 16.00 | 3.23 | 3.14 | 0.00 | 28.96 |
| G ₁₇ | 8.33 | 3.60 | 3.17 | 16.80 | 14.99 |
| G ₁₈ | 8.13 | 3.07 | 2.90 | 17.00 | 14.71 |
| G ₁₉ | 41.86 | 4.55 | 4.51 | 33.82 | 76.18 |
| G ₂₀ | 22.07 | 3.48 | 3.49 | 30.00 | 39.84 |
| LSD 1% | 1.89 | 0.76 | 0.72 | 2.88 | 2.40 |

Diameter of bulb: Diameter of bulb was statistically significant due to different days after planting (Appendix IVa). The result indicated that the germplasm G₁₉ gave the highest (4.51 cm) diameter of bulb followed by G₂ (4.32 cm). The lowest diameter of bulb (2.90 cm) was found from germplasm G₁₈ (Table 2).

Number of cloves per bulb: Highly significant variation was observed in the number of cloves per bulb among different germplasm (Appendix IVa). The maximum

number of cloves per plant was obtained from G₁₉ (33.82) followed by germplasm G₂ (32.96). The lowest number of cloves (0.00, 0.00, 0.00) was recorded from germplasm G₁₂, G₁₄ and G₁₆ respectively. Germplasm G₁₂, G₁₄ and G₁₆ did not form any clove in the bulb (Table 2).

Yield of bulb per plot: Different germplasm showed highly significant variations on yield of garlic per plot (Appendix IVa). Germplasm G₁₉ gave the highest (76.18 kg) yield per plot followed by germplasm G₂ (57.09 kg).

The lowest yield per plot (14.71 kg) was obtained from germplasm G₁₈ (Table 2).

Yield of bulb per hectare: The yield of garlic per plot was converted into per hectare and was expressed in tons. Yield per hectare of different germplasm showed highly

significant variations (Appendix IVa). Germplasm G₁₉ gave the highest (20.59 t/ha) yield per hectare followed by germplasm G₂ (15.43 t/ha). The lowest yield per hectare (3.98 t/ha) was obtained from germplasm G₁₈ (Fig. 1).

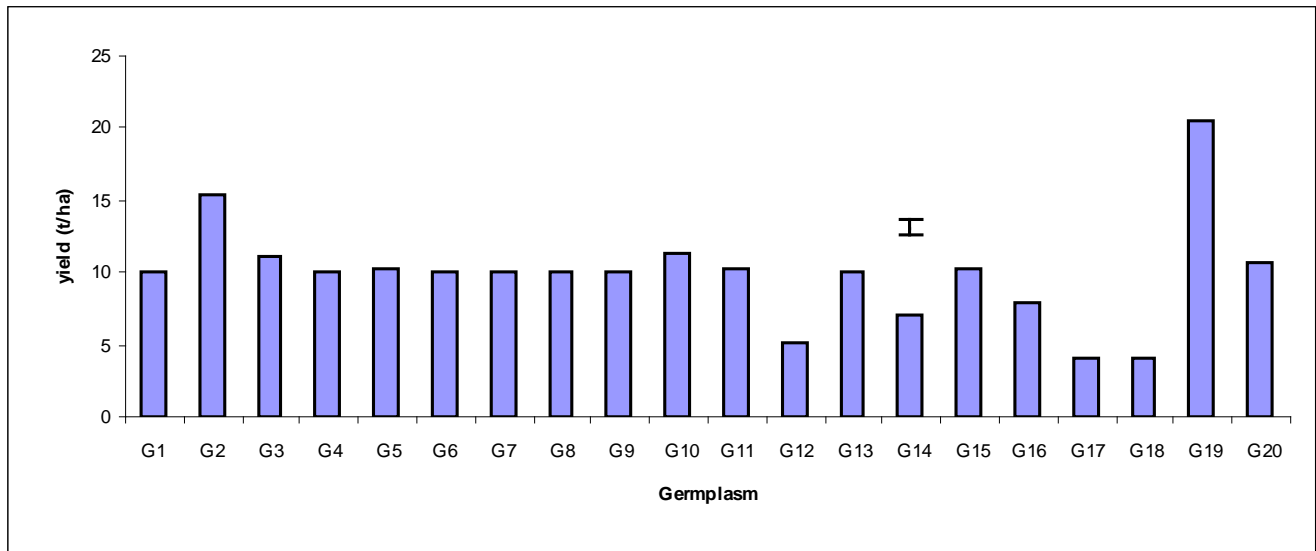


Fig. 1. Yield of 20 garlic germplasm under dry land condition at BAU, Mymensingh. Vertical bar represents LSD at 5% level.

Different germplasm resulted better performance in respect of height of plant, number of leaves per plant, fresh weight of bulb, length +diameter of bulb, total number of cloves per bulb, yield per plot and yield in ton per hectare. Germplasm G₁₉ gave the highest results in all the mentioned parameters. This might be due to the fact that germplasm G₁₉ and G₂ 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 in terms of yield potential were G₂ and G₁₉.

The experiment was conducted with 20 garlic germplasm during the 2003-04 growing season under dry land condition. All the parameters studied were significantly influenced by germplasm. The germplasm G₁₉ gave the highest values on all parameters studied, and gave the highest yield of bulb (20.93 t/ha) followed by G₂ (15.43

t/ha). The lowest yield per hectare (3.98 t/ha) was obtained from germplasm G₁₈.

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