A field experiment was conducted to evaluate the interaction effect of nitrogen and potassium on growth and yield related characters of two garlic varieties at the of Spices Research Center, Bogra during November 2000 to March 2001. The experiment consists of two garlic accessions i.e. Accession G19 and G20 with four levels of nitrogen (0, 100, 200, 300 kg N ha⁻¹) and potassium (0, 100, 200, 300 kg K₂O ha⁻¹). The three factorial experiment was laid out in a randomized complete block design with three replications. Results demonstrated that there was significant variation present among the studied treatments. Between the varieties, accession G20 showed the best performance (8.08 t ha⁻¹). The solitary application both of N and K₂O also increase the growth and yield of garlic at considerable amount. Among the treatments the highest bulb yield was achieved by using 200 kg N ha⁻¹ and 200 kg K₂O ha⁻¹ (9.62 and 8.61 t ha⁻¹ respectively). This study suggested that the treatment combination of accession G20 with 200 kg N ha⁻¹ and 200 kg K₂O ha⁻¹ will be more profitable (11.03 t ha⁻¹) than any other studied treatment combinations.
garlic from other exporter countries. But this problem can be sorted out by using proper nutrient management practices (proper doses of different fertilizers) and also by using of high yielding variety. Improving productivity and quality of crop, soil nutrient management plays a significant role (Zhou et al., 2005). Garlic is a nutrient exhaustive crop and removes a good amount of nitrogen, phosphorus and sulphur from the soil. To improve growth, yield and marketable proportions as well as quality of the crop uptake of sufficient nutrient by the garlic crop is important (Nai-hua et al., 1998). Due to genetic and environmental factors, garlic yield is low in many parts of the world, in spite of its importance (increasing of garlic production and productivity) (Nonnecke, 1989). In many garlic producing areas, lack of available nutrients has been identified as the limiting factor next to soil water, due to uptake and liberation of N, P and S from soil organic matter depends upon availability of water (FAO, 2003). Nitrogen and potassium played an important role among the different nutrients in the growth and development of garlic. These are the most responsive nutrients, in terms of plant development and production, contributing to increased productivity and quality of the bulbs. Due to low levels of organic matter, most of the agricultural lands in Bangladesh are deficient in nitrogen. Imbalanced and poorly monitored nitrogen application to the environment limits yields and induces large losses of reactive nitrogen. (Cassman et al., 2002). The rate of leaf initiation and extension of garlic in early growth is increased due to nitrogen application (Garcia, 1980; Koltunov, 1984). Bulb growth and development is also improved by nitrogen (Buwalda and Freeman, 1987, Fritsch et al., 1990; Hossain, 1997). As the levels of nitrogen increased from 0 to 400 kg ha\(^{-1}\) the growth and yield of garlic increased significantly beyond which yield declined (Lachica, 1982). The dry matter production of bulbs and bulb yield were increased due to nitrogen application (Hedge, 1988). Zaman et al., 2011 reported that application of 150 kg N ha\(^{-1}\) produced a good yield of garlic. Macêdo et al., (2009) observed that an N dose of up to 180 kg ha\(^{-1}\) enabled linear gains in the total productivity of cv. Roxo Pérola de Caçador. Fernandes et al., (2010) observed increased linear behavior, and the dose of 320 kg ha\(^{-1}\) of N yield values of 9.1 t ha\(^{-1}\) of the total productivity of cv. Caçador LV. Many authors has also been reported that the positive and significant response of garlic to applied nitrogen (Brabma and Yousuf, 2008; Talukder et al., 1998; Uddin, 1993). Besides this, potassium plays a crucial role in different plant metabolism, such as photosynthesis, photosynthates translocation, plant pores regulation, activation of plant catalyst and resistance against pests and diseases, hence improve the quality. It improves the color, glossiness and dry matter accumulation besides improving quality of the garlic. Garlic’s demand for K ranges from 125 to 180 kg K\(_2\)O ha\(^{-1}\) (Bertoni and Morard du L. Espagnacq, 1988). Due to genetic and environmental factors, garlic yield is low in many parts of the world, in spite of its importance (increasing of garlic production and productivity) (Nonnecke, 1989). In many garlic producing areas, lack of available nutrients has been identified as the limiting factor next to soil water, due to uptake and liberation of N, P and S from soil organic matter depends upon availability of water (FAO, 2003). Nitrogen and potassium played an important role among the different nutrients in the growth and development of garlic. These are the most responsive nutrients, in terms of plant development and production, contributing to increased productivity and quality of the bulbs. Due to low levels of organic matter, most of the agricultural lands in Bangladesh are deficient in nitrogen. Imbalanced and poorly monitored nitrogen application to the environment limits yields and induces large losses of reactive nitrogen. (Cassman et al., 2002). The rate of leaf initiation and extension of garlic in early growth is increased due to nitrogen application (Garcia, 1980; Koltunov, 1984). 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Since meager work has been conducted under Bangladeshi conditions in this regard, an investigation was conducted to assess the impact of interaction effect of nitrogen and potassium on yield and yield related characters of two garlic varieties.

Materials And Method:-

The experiment was conducted at the farm of Spices Research Center, Bogra from november 2000 to march 2001 with a view to investigating the effect of nitrogen, potassium and garmplam in the growth and yield of garlic. The three factorial experiment was laid out in a randomized complete block design with three replications. In each block, the land was divided into 32 plots and each plot size was 1.2 m x 1.0 m. The space between the blocks and plots were 1.0 m and 350 cm, respectively. The selected accessions of garlic cloves were placed at a depth of 2 cm in the soil with the use of a pointed stick. The organic matter content of the experimental plot was low and acidic in nature. The total N and exchangeable K status of the soil were also low. Ten days before the clove planting, the entire quantity of well decomposed cow dung and TSP @15 ton and 120 kg ha\(^{-1}\) were applied at final land preparation. Urea and MoP were applied as a source of nitrogen and potassium at two split date (30 and 60 days after planting) as top dressing. Garlic seeds were planted in the first week of november. Intercultural operations were done as per required. Data on plant growth, yield parameters, and bulb yield were recorded. The mean for all treatments were calculated and the analyses of variances for most of the characters under consideration were performed by ‘f’ ‘variance test. The significance of the difference between pairs of means was expressed as least significance different (LSD) test taking the probability level 5% as the minimum unit of significance (Gomez and Gomez, 1984).

| Table 01: Treatments of the experiment |
|----------------------------------------|
| **Factor A:** Two garmplam              |
| **Factor B:** Four levels of nitrogen  |
| **Factor C:** Four levels of potassium |
| Accession G\(_{19}\) | N\(_{0}\): 0 k N ha\(^{-1}\) (control) | K\(_{0}\): 0 kg K\(_2\)O ha\(^{-1}\) (control) |
| Accession G\(_{20}\) | N\(_{1}\): 100 kg N ha\(^{-1}\) | K\(_{1}\): 100 kg K\(_2\)O ha\(^{-1}\) |
|                                      | N\(_{2}\): 200 kg N ha\(^{-1}\) | K\(_{2}\): 200 kg K\(_2\)O ha\(^{-1}\) |
|                                      | N\(_{3}\): 300 kg N ha\(^{-1}\) | K\(_{3}\): 300kg K\(_2\)O ha\(^{-1}\) |
Results And Discussion:

Plant height
Garlic varieties showed significant variation (P < 0.01) on the mean plant height at different days after planting (Table 02). Height of plant from both garmplasm showed an increasing trend up to 90 DAP (Fig. 1). At 90 DAP, the higher plant height (51.97 cm) was obtained from Accession G2, and the lower (49.75 cm) from Accession G1. Fig. 3 and Fig. 5 showed among the different treatment of N and P, the rate of 200 kg N ha$^{-1}$ (55.36 cm) and 200 kg K$_2$O ha$^{-1}$ (47.96 cm) gave the maximum plant height respectively and minimum from the control treatment (P< 0.01). The positive and significant association of garlic to nitrogen has also been reported by many authors (Brabma and Yousuf, 2008; Talukder et al., 1998; Uddin, 1993; Setty et al., 1989; Soto, 1988). The interaction effect between nitrogen and potassium relating to plant height was also found to be significant (Table 02). At 90 DAP, the highest plant height (57.86 cm) was found in the treatment combination of 200 kg N ha$^{-1}$ and 200 kg K$_2$O ha$^{-1}$, with Accession G2 and the lowest plant height (38.15 cm) was observed from 0 kg N ha$^{-1}$ and 0 kg K$_2$O ha$^{-1}$ treatment combination (Table 07).

Number of green leaves plant$^{-1}$
Accession G2 produced the highest number of green leaves per plant (8.13) where Accession G1 produced the lowest (7.67) at 90 DAP (Fig. 2). Among the different rates of fertilizer, 200 kg N ha$^{-1}$ (55.36 cm) and 200 kg K$_2$O ha$^{-1}$ (8.03) performed the best compared to control (Fig. 4 and Fig. 6). A similar result was also reported by Talukdar (1998) who obtained a higher leaf number from the same level of potassium. At 90 DAP, the maximum number of green leaves per plant (8.43) was obtained from 200 kg N ha$^{-1}$ and 200 kg K$_2$O ha$^{-1}$ treatment combinations, and the minimum number of green leaves per plant (6.75) was obtained from the combination of 0 kg N ha$^{-1}$ and 0 kg K$_2$O ha$^{-1}$ (Table 07). Karic et al., (2005) investigated the response of leek to different levels of nitrogen and observed no effect on the number of leaves per plant in all N levels.

Number of cloves bulb$^{-1}$
Significant variation was observed among the accessions about the number of cloves per bulb (Table 02). The higher number of cloves per bulb (20.88) was found in Accession G2, whereas the Accession G1 produced the lower (19.22) (Table 03). The application of the highest average number of cloves per bulb was obtained from the plants grown with 200 kg N ha$^{-1}$ (23.63) and 200 kg K$_2$O ha$^{-1}$ (22.12) produced the maximum number of cloves per bulb while minimum from the control treatment at harvest (Table 02, 03 and 04). This is an agreement with the reports of several authors (Hossain, 1997; Talukder, 1998). The treatment combination of accession G2 with 200 kg N ha$^{-1}$ and with 200 kg K$_2$O ha$^{-1}$ produced the maximum number of cloves per bulb (24.68 and 23.55 respectively), and the minimum (15.40 and 13.88 respectively) was observed from the combination of Accession G1 with 0 kg N ha$^{-1}$ (Table 07). The result exhibited that the higher number of cloves per bulb was obtained due to the higher nutrient availability in soil, which enhanced the growth and development of the bulb.

Fresh weight of individual bulb
Significant variation was observed in fresh weight of the individual bulb at harvest between the garmplasm (Table 02). The maximum fresh weight of the individual bulb (12.97 g) was observed in Accession G2 and the minimum (12.05 g) was in Accession G1 (Table 03). It may be due to that Accession G2 gave the higher vegetative growth as well as leaf number. Among the treatment 200 kg N ha$^{-1}$ (15.41 g) and 200 kg K$_2$O ha$^{-1}$ (13.70 g) gave maximum fresh weight of individual bulb and minimum result was obtained from the control treatment (Table 03). Setty et al., (1989) found the higher weight of the bulb from higher nitrogen levels up to the level of 200 kg N ha$^{-1}$. The was significant variation among the combination of garmplasm and different levels of nitrogen in the fresh weight of individual bulb. The fresh weight of the individual bulb varied from 8.95 g to 16.13 g. The highest fresh weight of the individual bulb (16.13 g) was obtained from the treatment combination of accession G2 with 200 kg N ha$^{-1}$ (16.13 g) and 200 kg K$_2$O ha$^{-1}$ (14.09 g), whereas the lowest was observed in the accession G1 with 0 kg N ha$^{-1}$ and 0 kg K$_2$O ha$^{-1}$ (Table 07).

Bulb yield
In relation to bulb yield, the studied accessions and the treatment showed significant variation (Table 02). The higher bulb per plot (0.97 kg) was produced by the Accession G2 and lower from Accession G1 (0.90 kg) (Table 03). The higher yield obtained from Accession G2 was due probably due to the production of larger bulbs. Application of 200 N ha$^{-1}$ gave the highest yield per plot (1.16 kg) and lowest from the control treatment (0.68 kg). Similarly 200 Kg K$_2$O ha$^{-1}$ gave the maximum yield per plot (1.03 kg) and lowest from the control treatment (0.84 kg) (Table 03). The lowest yield per plot was observed from control treatment. This result was in partial conformity with the finding
of Lachica (1982), Setty et al., (1989) and Amin (1998). The combined effect of garplasm and different levels of potassium in respect of yield per plot and yield per hectare was found to be significant (Fig. 7 and 8). The maximum yield per plot (1.32 kg) was recorded from the treatment combination of accession \( G_1 \) with 200 kg N ha\(^{-1} \) and the minimum (0.48 kg) from accession \( G_1 \) with 0 kg N ha\(^{-1} \) and 0 kg K\(_2\)O ha\(^{-1} \) (Table 07). There was no significant interaction effect of garplasm, nitrogen and potassium on bulb yield per plot (Table 02).

**Conclusion:-**

The growth and yield parameters of this research indicated that the varieties had significant differences in the studied characters. Between the varieties, accession \( G_2 \) showed best performance by producing vegetative growth and higher bulb yields. The outcome of N and P fertilizer application on the performance of different garlic varieties suggested that both the fertilizer significantly enhanced plant height, produced the bulbs of greater marketable yield, total bulb yield. Among the different treatments, the highest bulb yield was achieved by using 200 kg ha\(^{-1} \) of N and K. It was apparent from the above result that the treatment combination of accession \( G_3 \) with 200 kg N ha\(^{-1} \) and 200 kg K\(_2\)O ha\(^{-1} \) was more profitable that the rest of the treatment combinations.

**Table 02:-** Analysis of variance on the data of growth and yield of garlic as influenced by garplasm, nitrogen and potassium

| Source of variation | Degre of freedom (df) | DAP | 45 DAP | 60 DAP | 75 DAP | 90 DAP | DAP | 45 DAP | 60 DAP | 75 DAP | 90 DAP | DAP | 45 DAP | 60 DAP | 75 DAP | 90 DAP |
|---------------------|----------------------|-----|-------|-------|-------|-------|-----|-------|-------|-------|-------|-----|-------|-------|-------|-------|
| Plant height (cm) at 30 DA |                      |     |       |       |       |       |     |       |       |       |       |     |       |       |       |       |
|                      |                      |     |       |       |       |       |     |       |       |       |       |     |       |       |       |       |
|                      |                      |     |       |       |       |       |     |       |       |       |       |     |       |       |       |       |
| Number of green leaves/plant at 30 DA |                  |     |       |       |       |       |     |       |       |       |       |     |       |       |       |       |
|                      |                      |     |       |       |       |       |     |       |       |       |       |     |       |       |       |       |
|                      |                      |     |       |       |       |       |     |       |       |       |       |     |       |       |       |       |
| Yield /plot (kg)                   |                      |     |       |       |       |       |     |       |       |       |       |     |       |       |       |       |
|-----------------------------------|----------------------|-----|-------|-------|-------|-------|-----|-------|-------|-------|-------|-----|-------|-------|-------|-------|
| Block                            | 2                    | 0.00 | 2.14 | 1.65 | 0.65 | 0.58 | 5.18 | 0.00 | 0.71 | 0.82 | 0.00 | 0.61 | 0.00 |
| Treatment                        | 31                   | 0.83 | 16.2 | 32.24 | 62.82 | 86.28 | 0.00 | 0.20 | 0.02 | 0.20 | 0.02 | 0.20 | 0.02 |
| Garplasm (A)                     | 1                    | 25.1 | 20.7 | 72.7 | 68.28 | 118.9 | 0.00 | 0.30 | 0.05 | 0.60 | 0.05 | 0.30 | 0.05 |
| Nitrogen (B)                     | 3                    | 0.03 | 88.4 | 258.3 | 65.1 | 718.5 | 0.00 | 0.25 | 0.05 | 0.71 | 0.05 | 0.25 | 0.05 |
| A X B                            | 3                    | 0.04 | 1.45 | 2.07 | 2.60 | 2.03 | 0.00 | 0.04 | 0.02 | 0.05 | 0.02 | 0.04 | 0.02 |
| Potassium (C)                    | 3                    | 0.00 | 38.1 | 23.65 | 46.79 | 108.9 | 0.00 | 0.04 | 0.04 | 0.01 | 0.04 | 0.04 | 0.01 |
| A X C                            | 3                    | 0.01 | 1.77 | 0.59 | 0.71 | 0.36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| B X C                            | 9                    | 0.03 | 8.51 | 4.05 | 6.88 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| A X B X C                        | 9                    | 0.02 | 0.73 | 0.82 | 0.51 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Error                            | 62                   | 0.08 | 3.20 | 0.50 | 0.66 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

DAP: Days After Planting

**Table 03:-** Main effect garplasm, nitrogen and potassium on growth and yield of garlic

| Treatment Combinations | Bulb fresh weight (g) plant\(^{-1} \) | No. of cloves bulb\(^{-1} \) | Yield plot\(^{-1} \)(kg) |
|------------------------|-------------------------------------|---------------------|---------------------|
| \( G_1 \)              | 12.05                               | 19.22               | 0.90                |
| \( G_2 \)              | 12.97                               | 20.88               | 0.97                |
| LSD (0.05)             | 0.19                                 | 0.18                | 0.02                |
| LSD (0.01)             | 0.26                                 | 0.24                | 0.03                |

Levels of nitrogen
### Table 04: Combined effect of germplasm and nitrogen on growth and yield of garlic

| Treatment combination | Plant height (cm) at 30 DAP | Plant height (cm) at 45 DAP | Plant height (cm) at 60 DAP | Plant height (cm) at 75 DAP | Plant height (cm) at 90 DAP | Number of green levels plant at 30 DAP | Number of green levels plant at 45 DAP | Number of green levels plant at 60 DAP | Number of green levels plant at 75 DAP | Number of green levels plant at 90 DAP | Fresh weight bulb plant⁻¹ (g) | No. of cloves bulb⁻¹ | Yield plot la (kg) |
|-----------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|-----------------------------------|-----------------|-----------------|
| G₁N₀                  | 24.1                        | 30.2                        | 34.0                        | 38.0                        | 42.4                        | 4.17                                  | 5.46                                  | 5.80                                  | 6.63                                  | 6.99                                  | 8.95                | 15.40           | 0.65            |
| G₁N₁                  | 24.0                        | 32.2                        | 37.5                        | 44.1                        | 49.8                        | 4.76                                  | 5.59                                  | 6.42                                  | 7.08                                  | 7.03                                  | 11.42               | 18.03           | 0.86            |
| G₁N₂                  | 24.1                        | 34.1                        | 39.9                        | 48.3                        | 54.2                        | 4.78                                  | 5.63                                  | 6.65                                  | 7.08                                  | 7.90                                  | 14.69               | 22.58           | 1.10            |
| G₁N₃                  | 24.1                        | 33.6                        | 40.7                        | 48.0                        | 52.5                        | 4.90                                  | 5.93                                  | 6.78                                  | 7.13                                  | 8.08                                  | 16.36               | 26.36           | 0.70            |
| G₂N₀                  | 25.0                        | 30.9                        | 35.3                        | 39.2                        | 43.8                        | 4.89                                  | 5.84                                  | 6.89                                  | 7.27                                  | 8.30                                  | 11.97               | 20.24           | 0.90            |
| G₂N₁                  | 25.2                        | 32.7                        | 39.7                        | 46.7                        | 52.3                        | 4.91                                  | 6.14                                  | 7.16                                  | 7.59                                  | 8.58                                  | 14.45               | 22.25           | 1.08            |
| G₂N₂                  | 25.1                        | 34.5                        | 43.1                        | 49.2                        | 55.3                        | 3.8                                   | 0.90                                  | 2.00                                  | 2.00                                  | 2.00                                  | 0.39                | 0.52            | 0.04            |
| G₂N₃                  | 25.1                        | 34.5                        | 43.1                        | 49.2                        | 55.3                        | 3.8                                   | 0.90                                  | 2.00                                  | 2.00                                  | 2.00                                  | 0.39                | 0.52            | 0.04            |
| LSD (0.05)             | 0.24                        | 1.46                        | 0.58                        | 0.66                        | 0.55                        | 0.08                                  | 0.24                                  | 0.09                                  | 0.07                                  | 0.26                                  | 0.24                | 0.10            | 0.35            |
| LSD (0.01)             | 0.32                        | 1.94                        | 0.77                        | 0.88                        | 0.73                        | 0.10                                  | 0.32                                  | 0.11                                  | 0.10                                  | 0.35                                  | 0.32                | 0.10            | 0.35            |

_**Notes:**_

- a = unit plot size was 1.2 m x 1.0 m
- G₁ = Accession G₁₀
- G₂ = Accession G₂₀
- N₀ = 0 kg N/ha
- N₁ = 100 kg N/ha
- N₂ = 200 kg N/ha
- N₃ = 300 kg N/ha
### Table 05: Combined effect of garlic plant and potassium on growth and yield of garlic

| Treatment combinations | Plant height (cm) at 30 DAP | Number of green levels at 30 DAP | Fresh weight bulb plant⁻¹ (g) | No. of cloves bulb⁻¹ | Yield plot⁻¹ (kg) |
|------------------------|-----------------------------|---------------------------------|-------------------------------|---------------------|-----------------|
| G₁K₀                   | 24.1                        | 24.1                            | 50.52                         | 7.42                | 17.40           |
| G₁K₁                   | 24.0                        | 24.0                            | 49.81                         | 7.15                | 16.31           |
| G₁K₂                   | 24.1                        | 24.1                            | 49.52                         | 6.98                | 15.21           |
| G₁K₃                   | 24.0                        | 24.0                            | 49.23                         | 6.84                | 14.13           |
| G₂K₀                   | 24.1                        | 24.1                            | 48.94                         | 6.71                | 13.04           |
| G₂K₁                   | 24.0                        | 24.0                            | 48.65                         | 6.57                | 12.04           |
| G₂K₂                   | 24.1                        | 24.1                            | 48.36                         | 6.44                | 11.05           |
| G₂K₃                   | 24.0                        | 24.0                            | 48.07                         | 6.30                | 10.06           |

### Table 06: Combined effect of nitrogen and potassium on growth and yield of garlic

| Treatment combinations | Plant height (cm) at 30 DAP | Number of green levels at 30 DAP | Fresh weight bulb plant⁻¹ (g) | No. of cloves bulb⁻¹ | Yield plot⁻¹ (kg) |
|------------------------|-----------------------------|---------------------------------|-------------------------------|---------------------|-----------------|
| N₀K₀                   | 24.44                       | 24.44                           | 50.52                         | 7.42                | 17.40           |
| N₀K₁                   | 24.55                       | 24.55                           | 49.81                         | 7.15                | 16.31           |
| N₀K₂                   | 24.59                       | 24.59                           | 49.52                         | 6.98                | 15.21           |
| N₀K₃                   | 24.69                       | 24.69                           | 49.23                         | 6.84                | 14.13           |
| N₁K₀                   | 24.70                       | 24.70                           | 48.94                         | 6.71                | 13.04           |
| N₁K₁                   | 24.67                       | 24.67                           | 48.65                         | 6.57                | 12.04           |
| N₁K₂                   | 24.63                       | 24.63                           | 48.36                         | 6.44                | 11.05           |
| N₁K₃                   | 24.58                       | 24.58                           | 48.07                         | 6.30                | 10.06           |
| N₂K₀                   | 24.65                       | 24.65                           | 47.71                         | 5.93                | 14.40           |
| N₂K₁                   | 24.58                       | 24.58                           | 47.42                         | 5.79                | 13.79           |
| N₂K₂                   | 24.63                       | 24.63                           | 47.13                         | 5.65                | 13.18           |
| N₂K₃                   | 24.58                       | 24.58                           | 46.84                         | 5.51                | 12.60           |

LSD (0.05) = 0.24, (0.01) = 0.32
| N3K 3 | 24.54 | 34.33 | 41.93 | 49.69 | 5.85 | 4.87 | 5.75 | 6.92 | 7.32 | 8.33 | 15.16 | 24.90 | 1.14 |
| N3K 0 | 24.63 | 33.47 | 41.16 | 47.12 | 52.49 | 4.85 | 5.68 | 6.82 | 7.08 | 8.97 | 12.46 | 19.56 | 0.93 |
| N3K 1 | 24.64 | 34.10 | 41.42 | 48.05 | 53.97 | 4.82 | 5.60 | 6.72 | 7.12 | 8.08 | 13.87 | 21.40 | 1.04 |
| N3K 2 | 24.62 | 34.77 | 42.49 | 49.86 | 55.02 | 4.83 | 5.88 | 6.75 | 7.28 | 8.22 | 14.76 | 23.35 | 1.13 |
| N3K 3 | 24.57 | 34.10 | 42.70 | 49.55 | 45.52 | 4.85 | 5.78 | 6.73 | 7.20 | 8.13 | 14.08 | 21.92 | 1.04 |
| LSD (0.05) | 0.34 | 2.07 | 0.82 | 0.94 | 0.77 | 0.11 | 0.34 | 0.12 | 0.10 | 0.37 | 0.55 | 0.05 | 0.06 |
| LSD (0.01) | 0.46 | 2.75 | 1.09 | 1.25 | 1.03 | 0.15 | 0.45 | 0.16 | 0.14 | 0.49 | 0.73 | 0.67 | 0.08 |
| Treatment combinations | Plant height (cm) at 30 DAP | Number of green levels at plant<sup>1</sup> | Fresh weight bulb plant<sup>1</sup> (g) | No. of cloves bulb<sup>1</sup> | Yield plot<sup>1</sup> (kg) |
|------------------------|-----------------------------|------------------------------------------|----------------------------------|-----------------------------|--------------------------|
| G<sub>1</sub>N<sub>1</sub>K<sub>1</sub> | 24.1 5 | 30.5 5 | 34.5 5 | 37.5 3 | 4.70 5.10 | 5.47 6.40 | 7.10 7.32 | 13.30 0.48 |
| G<sub>1</sub>N<sub>1</sub>K<sub>1</sub> | 24.1 0 | 30.27 5 | 33.3 4 | 37.8 4 | 42.5 3 | 4.67 5.53 | 5.77 6.67 | 7.27 8.63 | 15.37 0.64 |
| G<sub>1</sub>N<sub>1</sub>K<sub>2</sub> | 24.0 7 | 32.42 5 | 35.9 5 | 39.9 5 | 45.1 5 | 4.70 5.37 | 6.10 6.73 | 7.33 10.18 | 16.90 0.76 |
| G<sub>1</sub>N<sub>1</sub>K<sub>3</sub> | 24.1 4 | 32.20 3 | 36.3 9 | 39.6 5 | 44.3 8 | 4.77 5.83 | 5.87 6.73 | 7.27 9.67 | 16.02 0.73 |
| G<sub>1</sub>N<sub>1</sub>K<sub>4</sub> | 24.1 6 | 30.89 6 | 37.0 6 | 43.5 6 | 47.2 7 | 4.77 6.00 | 6.57 7.03 | 7.67 10.34 | 16.50 0.78 |
| G<sub>1</sub>N<sub>1</sub>K<sub>1</sub> | 24.0 7 | 32.52 6 | 37.4 3 | 44.1 3 | 49.3 1 | 4.77 5.47 | 6.30 7.10 | 7.73 10.80 | 17.97 0.81 |
| G<sub>1</sub>N<sub>1</sub>K<sub>2</sub> | 24.0 3 | 33.15 8 | 37.5 8 | 44.5 8 | 51.2 7 | 4.73 5.53 | 6.60 7.27 | 7.80 12.40 | 19.20 0.93 |
| G<sub>1</sub>N<sub>1</sub>K<sub>3</sub> | 24.0 5 | 32.32 2 | 38.0 2 | 44.1 2 | 51.0 0 | 4.77 5.37 | 6.20 6.93 | 7.70 12.13 | 18.47 0.89 |
| G<sub>1</sub>N<sub>2</sub>K<sub>0</sub> | 24.1 5 | 32.77 5 | 39.0 2 | 46.6 2 | 51.5 7 | 4.80 5.67 | 6.80 7.10 | 8.00 13.16 | 19.97 0.99 |
| G<sub>1</sub>N<sub>2</sub>K<sub>1</sub> | 24.0 8 | 33.54 4 | 39.6 4 | 47.5 8 | 53.9 0 | 4.83 5.73 | 6.70 7.17 | 8.10 14.03 | 21.40 1.05 |
| G<sub>1</sub>N<sub>2</sub>K<sub>2</sub> | 24.1 5 | 36.41 5 | 40.3 5 | 49.6 5 | 56.2 8 | 4.80 6.00 | 6.83 7.27 | 8.17 17.06 | 24.87 1.28 |
| G<sub>1</sub>N<sub>2</sub>K<sub>3</sub> | 24.0 5 | 33.80 5 | 40.5 7 | 49.3 9 | 55.2 3 | 4.80 5.47 | 6.70 7.03 | 8.03 14.49 | 24.07 1.09 |
| G<sub>1</sub>N<sub>3</sub>K<sub>0</sub> | 24.1 0 | 32.40 5 | 39.8 5 | 46.1 4 | 51.0 1 | 4.80 5.60 | 6.73 6.93 | 7.80 12.38 | 19.83 0.93 |
| G<sub>1</sub>N<sub>3</sub>K<sub>1</sub> | 24.1 0 | 34.61 5 | 40.1 5 | 46.9 6 | 52.8 7 | 4.77 5.53 | 6.63 7.07 | 7.87 13.73 | 20.57 1.93 |
| G<sub>1</sub>N<sub>3</sub>K<sub>2</sub> | 24.1 4 | 34.05 3 | 41.5 8 | 49.5 8 | 53.8 7 | 4.77 5.73 | 6.67 7.10 | 8.00 13.58 | 21.77 1.07 |
| G<sub>1</sub>N<sub>3</sub>K<sub>3</sub> | 24.0 5 | 33.05 5 | 41.4 7 | 49.4 1 | 52.7 6 | 4.80 5.67 | 6.57 7.20 | 7.73 12.87 | 21.27 0.96 |
| G<sub>2</sub>N<sub>0</sub>K<sub>0</sub> | 24.7 7 | 27.20 1 | 33.5 1 | 35.6 5 | 38.7 7 | 4.87 5.30 | 6.23 6.50 | 7.40 8.16 | 14.47 0.57 |
| G<sub>2</sub>N<sub>0</sub>K<sub>1</sub> | 25.0 0 | 31.86 0 | 35.0 6 | 39.3 6 | 44.2 7 | 4.87 5.70 | 5.97 6.73 | 7.57 9.06 | 15.87 0.68 |
| G<sub>2</sub>N<sub>0</sub>K<sub>2</sub> | 25.1 1 | 32.75 4 | 36.3 4 | 41.4 6 | 46.4 7 | 4.83 5.83 | 6.43 6.87 | 7.63 10.21 | 17.87 0.77 |
| G<sub>2</sub>N<sub>0</sub>K<sub>3</sub> | 25.2 3 | 31.88 7 | 36.5 4 | 40.6 6 | 45.7 7 | 4.87 5.87 | 6.40 6.73 | 7.70 9.89 | 17.23 0.74 |
| G<sub>2</sub>N<sub>1</sub>K<sub>0</sub> | 25.2 4 | 32.59 6 | 38.9 6 | 45.2 6 | 49.1 6 | 4.87 5.83 | 6.77 7.07 | 7.97 11.56 | 18.37 0.87 |
| G<sub>2</sub>N<sub>1</sub>K<sub>1</sub> | 25.2 6 | 33.51 1 | 39.5 1 | 46.8 4 | 52.3 8 | 4.90 5.8 | 6.73 7.13 | 8.07 12.11 | 20.07 0.91 |
| G<sub>2</sub>N<sub>1</sub>K<sub>2</sub> | 25.2 3 | 33.51 4 | 40.1 4 | 47.6 6 | 54.4 5 | 4.90 5.9 | 6.83 7.27 | 8.13 12.56 | 21.97 0.94 |
| G<sub>2</sub>N<sub>1</sub>K<sub>3</sub> | 25.1 2 | 31.29 5 | 40.2 5 | 47.1 4 | 53.2 0 | 4.93 6.07 | 6.80 7.07 | 8.17 11.62 | 20.57 0.87 |
| G<sub>2</sub>N<sub>2</sub>K<sub>0</sub> | 25.1 6 | 34.70 6 | 41.8 6 | 48.8 1 | 54.4 0 | 4.87 6.00 | 7.07 7.47 | 8.43 15.07 | 19.87 1.13 |
Table 07: Combined effect of garplasm, nitrogen and potassium on the growth and yield of garlic

| G2N2K1 | 25.0 | 35.37 | 42.0 | 49.7 | 55.6 | 4.93 | 6.17 | 7.13 | 7.60 | 8.57 | 15.95 | 23.70 | 1.20 |
|--------|------|-------|------|------|------|------|------|------|------|------|------|------|-----|
| G2N2K2 | 25.1 | 38.68 | 43.2 | 51.3 | 59.4 | 4.90 | 6.37 | 7.30 | 7.70 | 8.70 | 17.65 | 29.43 | 1.32 |
| G2N2K3 | 25.0 | 34.86 | 43.2 | 49.9 | 56.4 | 4.93 | 6.03 | 7.13 | 7.60 | 8.63 | 15.82 | 25.73 | 1.19 |
| G2N3K0 | 25.1 | 34.55 | 42.4 | 48.2 | 53.9 | 4.90 | 5.77 | 6.90 | 7.23 | 8.13 | 12.54 | 19.28 | 0.94 |
| G2N3K1 | 25.1 | 5.38  | 42.7 | 49.1 | 55.0 | 4.87 | 5.67 | 6.93 | 7.17 | 8.30 | 14.01 | 22.23 | 1.05 |
| G2N3K2 | 25.1 | 35.03 | 50.1 | 56.4 | 4.90 | 6.03 | 6.83 | 7.47 | 8.43 | 15.94 | 24.93 | 1.20 |

a = unit plot size was 1.2 m x 1.0 m

G1 = Accession G19
G2 = Accession G20

K0 = 0 kg K2O/ha
K1 = 100 kg K2O/ha
K2 = 200 kg K2O/ha
K3 = 300 kg K2O/ha

Fig. 1: Effect of garplasm on plant height of garlic at different days of planting

Fig. 2: Effect of garplasm on no. of green leaves of garlic at different days of planting
Fig. 3: Effect of nitrogen on plant height of garlic at different days of planting

Fig. 4: Effect of nitrogen on no. of green leaves of garlic at different days of planting

Fig. 5: Effect of potassium on plant height of garlic at different days of planting

Fig. 6: Effect of potassium on no. of green leaves of garlic at different days of planting

Fig. 7: Combined effect of germplasm and nitrogen on the yield of garlic (t/ha) at different days of planting

Fig. 8: Combined effect of germplasm and potassium on the yield of garlic at different days of planting
Fig. 9: Combined effect of nitrogen and potassium on the yield of garlic (t/ha) at different days of planting
In all the figure vertical bars indicate LSD at 0.05 level

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