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Effect of Nitrogenous Fertilizer on Growth and Yield of Garlic

A. A. Kakar, M. K. Abdullahzai, M. Saleem and S. A. Qaim Shah
Agricultural Research Institute, Sanab, Quetta, Pakistan

Abstract: Field experiments were conducted to assess the effect of different nitrogen levels on the growth and yield of garlic on clay loam soil. Eight nitrogen levels viz. 0, 50, 60, 70, 80, 90, 100 and 110 kg ha⁻¹ respectively were tested. Results demonstrated that increasing nitrogen level up to 110 kg ha⁻¹ resulted in longer leaves (64.83), greater number of leaves per plant (17.90), maximum single bulb weight (42.60 g), and bulb yield per plant (7.08 kg) and Bulb yield ha⁻¹ (674.03 kg). Further more, increase in nitrogen levels had no appreciable effect on the performance of garlic.

Key words: Garlic, nitrogen, yield, bulb yield

Introduction
Garlic (Allium sativum L.) is an important crop grown and used as spice or condiment through out the world as well as Pakistan. It is an other earning commodity for Pakistan, as a good quantity of garlic is exported every year and also it has a higher nutritive value then other bulb crops and its preparations are administered as a cure against some long lingering stomach diseases, sore eyes and earache. The per hectare yield of garlic can be increased by adopting proper package of practices like, timely planting, proper spacing, judicious application of irrigation water, besides these balance applications of nitrogen plays a vital role in the development of garlic.

Chaudhry (1979) reported that application of 1.25 to 150 kg N ha⁻¹ produced good yield of garlic. Aijaro and Gaetane (1978) applied nitrogen at 75-225 kg ha⁻¹ to garlic and obtained high yields. Optimum bulb size were obtained from treatments receiving nitrogen at 150kg ha⁻¹. Mauya and Bhuian (1982) noted that the highest yield (42.60 tonne) per hectare with plant spacing of 10x10 cm² receiving 150kg N ha⁻¹. Nelson (1983) observed high yield with the combination of nitrogen at 100, 150 or 200 kg ha⁻¹ and P at 25 or 35 kg ha⁻¹, and improved bulb size by increasing the nitrogen rate when combined with higher P rate also increased the yield. Gardenas (1986) reported that the best combination is of 80kg P, 0.3ha⁻¹ + 240kg N ha⁻¹ for best yield of garlic. Further Khosha (1994), suggested that NPK combination 70-20-70 kg ha⁻¹ performed better yield results of garlic.

Keeping in view the importance of garlic and above facts the present project was proposed to assess the effect of different nitrogen levels on the growth and yield of garlic under Usta Muhammad conditions.

Materials and Methods
Experiments were conducted at farmer field Usta Muhammad during the year 1999-2001 to determine the effect of different levels of nitrogen on growth and yield of garlic.

The experiments were laid out in randomized complete block design. The local variety of garlic was planted having a net plot area of 3.00 x 4.00m², keeping 1 feet distance between row to row and 9 inches distance between plant to plant to avoid extremely crowded condition. All the recommended doses of phosphorus and potassium were applied at the time of sowing with seed bed preparation and the nitrogen was applied in two split doses. All the agronomical operations were carried to eradicate weeds and pulverization of soil. Thinning and weeding was practiced and necessary spray against thrips was made to control insect attack. Farm yard manure at the rate of 15 tonnes per ha⁻¹ was applied by the farmer to improve the physical condition and create retardation of available nutrients. The farm yard manure applied was not in a composite condition and was taken from an open surface of collected dungs. The main soil characteristics were pH 8.0, organic matter 0.88%, total nitrogen 0.058%, available phosphorus 9.2 ppm, available K 10.0 ppm, calcium carbonate (CaCO₃) 32.3, MWHC (Maximum water holding capacity) 36.7% and soil porosity 8.0% followed by Klute (1986). The details of treatments are as under:-

\[ T_i: \text{kg ha}^{-1} \] (control); \[ T_2: 50; T_3: 60; T_4: 70; T_5: 80; T_6: 90; T_7: 100 \] and \[ T_8: 110 \text{kg N ha}^{-1} \]. At the time of maturity randomly 10 plants per treatment were selected and tagged to record growth and yield trials. After harvesting all the data thus collected were subjected to statistically analysis of variance on the basis of two years data by following the method of Gomez and Gomez (1984).

Results and Discussion
Results depicted (Table 1) that all the growth, yield components and yield ha⁻¹ were highly significantly affected by nitrogen levels. Further data revealed that application of 100 kg N ha⁻¹ responded maximum growth, yield components and yield ha⁻¹ following by higher (110 kg N ha⁻¹) and lower (90 kg N ha⁻¹). However, the minimum traits of growth and yield components were recorded in control following by lowest level (50 kg N ha⁻¹). Application of 100 kg N ha⁻¹ recorded maximum bulb yield of 674.03 kg ha⁻¹, followed by 110 and 90 kg N ha⁻¹ given 652.81 and 623.0 kg ha⁻¹, respectively (Fig. 1). Where as untreated (control) recorded minimum bulb yield of 349.20 kg ha⁻¹ followed by lowest levels of nitrogen 50 and 60 kg N ha⁻¹, by given 453.68 and 485.68 kg bulb yield ha⁻¹ respectively.

The results are in agreement with the finding of Nelson (1983). Gardenas (1986) and Khosha (1994), Who also claimed that increasing nitrogen level up to 100 kg ha⁻¹, resulted in better performance of growth and yield of garlic under Usta Muhammad conditions.

Leghari et al. (1997) observed that all the yield components were significantly affected by nitrogen levels except height and number of leaves per plant in onion but interaction showed significant response for single bulb weight and per hectare yield. Shekht et al. (2000) reported the maximum seed yield with the combination of N-P at the rate of 200 - 150 kg ha⁻¹, in turn.

Qayyum et al. (1999) reported that increase the level of nitrogen up to 120 kg ha⁻¹ progressively increase seed yield by increasing other yield components such as plant height, pods per plant and observed highly significant response at \( P = 0.01 \) (44.8) in Brassica napus. Larik et al. (1999) showed that the flowers Zinnia elegans showed maximum plant height at the higher rate of nitrogen and potassium. Ahmed et al. (2001) reported linear increase in plant height, number of branches with increase in nitrogen level after a two years experiment on sesame genotypes.

From the results, it is obvious that nitrogen, which effect yield by affecting all the components, which are responsible for higher yield. The roles of phosphorus although not ignored for the uptake of nutrients do not play a vital role in increasing yield. The role of K is only the acceleration for uptake of N and P macro nutrient and improved plant vigor by increasing immunity against plant diseases but potassium some time may improve dry matter yield which could be dealt as yield component. The results also
Kakar et al.: Garlic, nitrogen, yield, bulb yield

Table 1: Mean growth and yield traits of garlic as affected by different leaves of nitrogen

<table>
<thead>
<tr>
<th>Treatments (kg N ha⁻¹)</th>
<th>Height (cm)</th>
<th>Leaves/plant</th>
<th>Cloves/bulb</th>
<th>Weight of single bulb (g)</th>
<th>Bulb yield/ plant (kg)</th>
<th>Bulb yield ha⁻¹ (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>36.53g</td>
<td>873.00b</td>
<td>37.90e</td>
<td>31.10b</td>
<td>3.86e</td>
<td>3492.05e</td>
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<tr>
<td>50</td>
<td>44.46f</td>
<td>10.72g</td>
<td>40.98d</td>
<td>34.33g</td>
<td>4.76de</td>
<td>4539.68de</td>
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<tr>
<td>60</td>
<td>51.62e</td>
<td>11.99f</td>
<td>43.26c</td>
<td>36.10f</td>
<td>5.13d</td>
<td>4888.89d</td>
</tr>
<tr>
<td>70</td>
<td>55.16d</td>
<td>12.83e</td>
<td>44.80d</td>
<td>37.60e</td>
<td>5.85cd</td>
<td>5600.00cd</td>
</tr>
<tr>
<td>80</td>
<td>58.23c</td>
<td>14.19d</td>
<td>45.36b</td>
<td>38.30d</td>
<td>6.12bcd</td>
<td>5825.39bcd</td>
</tr>
<tr>
<td>90</td>
<td>60.10b</td>
<td>15.63c</td>
<td>46.60a</td>
<td>39.30c</td>
<td>6.56bc</td>
<td>6238.09</td>
</tr>
<tr>
<td>100</td>
<td>64.83a</td>
<td>17.90a</td>
<td>48.80a</td>
<td>42.60a</td>
<td>7.08a</td>
<td>6748.03a</td>
</tr>
<tr>
<td>S.E +</td>
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<tr>
<td>sbi</td>
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<tr>
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<td>00.173</td>
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<tr>
<td>cv %</td>
<td>02.106</td>
<td>02.88</td>
<td>03.138</td>
<td>02.947</td>
<td>5.788</td>
<td>0055.718</td>
</tr>
</tbody>
</table>

Values followed by similar letters are not significantly different at P≤0.05

Fig. 1: Mean bulb yield (Kg ha⁻¹) as affected by different nitrogen level

revealed that the nitrogen seems effective up to some levels after which beyond that level it could not affect yield rather helps in decreasing or stable yield. The results in garlic further proved the law of diminishing return.

References