Effect of Different Source of Nutrients on the Performance, Growth and Quality of Summer Onion

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Abstract: The field experiments were conducted for one season rabi 2008-09 at the Multilocation testing site Magura on calcareous soil to study the effect of integrated nutrient management on the growth and yield of onion (cv. BARI piaj 2). The experiment was laid out in a RCB design. There were five treatments involving four inorganic levels and organic levels another absolute control (no manure and no NPK). Higher level of inorganic T₁ i.e., (120-45-85-40 kg ha⁻¹ NPK S+ 5 t/ha CD) produced significantly higher bulb yield (18.76 t/ha) which was on par with T₂ (17.87 t/ha) i.e., 5 t/ha poultry manure + remaining amount from inorganic fertilizer T₂. The results also indicated that the same treatments recorded the highest single bulb weight, bulb yield as well as gross returns and MBCR (7.14) as compared to other treatments.

Key words: Growth, Inorganics, Organics, Onion, Yield

Introduction

Onion (Allium cepa. L) is one of the most important commercial spices in Bangladesh. It stands second in respect of area and production in Bangladesh. At present Bangladesh produces 12 lakh metric tons of onion from 1.42 lakh hectares of land (DAE, 2009). The average production is 5.72 ton/ha. The annual national demand of onion is about 16 lakh ton. There is a running short is about 4 lakh ton (Annon., 2006) .. Every year Bangladesh import huge amount of onion from the neighboring countries and expend about 500 to 600 crore taka. (Annon., 2005-06). However, the productivity of onion in Bangladesh is quite low as compared to world’s productivity. So, there is an acute shortage of onion in relation to its requirement. This can be done by many ways of which the most important are the continuous and liberal use of inorganic fertilizer alone affects soil health and thus resulting in lower yield with poor quality produce (Mamatha, 2006). Plant nutrition plays an important role for enhancing yield and quality in onion. The cost of inorganic fertilizers has been enormously increasing to an extent that they are out of reach of the poor, small and marginal farmers.

Integrated Plant Nutrition System (IPNS) is ‘the management of all available plant nutrient sources, organic and inorganic, to provide optimum and sustainable crop production conditions within the prevailing farming system’ (BARC, 2005). In Bangladesh, Several scientists were revealed that the integrated nutrient management with organic and inorganic fertilizers to conserve the soil health and to get good quality produce. Although, the weather conditions seem to be friendly for the proper growth of onion but research work is very insufficient.

Organic material such as farmyard manure, mustard oil cake, vermicompost, poultry manure and bio-slurry improve soil physical and chemical properties that are important for plant growth (Synman et al., 1998). Many researchers have found that addition of animal manure resulted in higher onion yield and nutrient uptake compared to NPK fertilizer. (Kumar et al., 2001, Rumpel, 1998 and Sharma et al., 2003). Mixture of chicken manure and bio-fertilizer increases the yield of onion and enriched nutrient content in tuber was reported by Shaheen et al., (2007). Keeping in view these aspects, the present research work was initiated to determine the ideal integrated nutrient management package on growth, yield and quality of onion.

Materials and Methods

The experiment was carried out in the farmer’s field at the MLT site Magura during 2008-09. Four different treatments with control and six dispersed replications were conducted in 15 plots. T₁ (Recommended from Ph.D work)= (120-45-85-40 kg ha⁻¹ NPK S+ 5 t/ha CD), T₂ (Recommended from spice research center)= (90-55-75-20 kg ha⁻¹ NPKS), T₃(IPNS)= 3 t/ha poultry manure + remaining amount from inorganic fertilizer T₂, T₄(IPNS)= 5 t/ha poultry manure + remaining amount from inorganic fertilizer T₂ and T₅= (00-00-00-00 kg ha⁻¹ NPKS).

The unit plot size was 2m x 2m. Fifty days old seedling BARI Piaj-02 was planted on 07 April 2008 maintaining the row spacing 15cm and plant to plant distance 10 cm. Fertilizers were applied as per treatments. Total cowdung /poultry manure, TSP and Gypsum were used at final land preparation. 1/3rd urea and ½ MP were used as 1st top dress on 19 April
2008. 1/3rd urea were used as 2nd top dress on 30 April 2008 and rest 1/3 rd urea and ½ MP were used as 3rd top dress on May 2008. The crop was irrigated thrice April 8, 19 and 27 of 2008 and harvested on 10 June 2008. The data were collected; analyzed statistically and mean separation was done by DMRT. Data were recorded by selecting plants randomly from each treatment plot and average was calculated for the statistical analysis. The parameters under study were plant height (cm), number of leaves per plant, Single Bulb weight (g), No. of bulb/kg, bulb diameter (cm), and total yield per hectare (tonnes). The mean data were subjected to the Analysis of Variance Technique (Steel and Torrie, 1984) using the "MSTATC" Computer software package. Duncan’s Multiple Range Tests (Duncan, 1955) was adopted for comparing their means among the treatments showing significant difference. Here, total variable cost (TVC) estimate through fertilizer price.

**Results and Discussions**

Data about effects of organic and chemical fertilizer on onion yield contributing criteria are given below in Table 1. The highly significant data pertaining to plant height as affected by different application of treatments on onion. The T1 treatment resulted in tallest plant height (39.57 cm) closely related to T4 and T2 treatments with 34.17 cm and 33.67 cm plant height respectively. Similarly, significantly higher plant height in onion with application of vermicompost was reported by Reddy and Reddy (2005). Higher levels of FYM significantly increased the plant height, number of leaves per plant (Reddy and Reddy, 2005) and leaf area per plant (Lal et al., 2002) in onion. The maximum leaves per plant was observed from the treatment T1 (7.83) which was statistically differ from the other treatments.

The data regarding single bulb weight was observed that all the treatments significantly affected bulb weight. The highest single bulb weight was obtained from the treatment T4 (20.33 gm) which was statistically similar with T5 (19.00 gm). The lowest single bulb weight was obtained from the treatment T3 (12.00 gm).

The data pertaining to number of bulb per kg showed that all the treatments affected significantly number of bulb per kg. The treatment T5 (82.67) showed highest number of bulb per kg followed by T3 and T2 treatments. The lowest number of bulb per kg was observed from T1 (49.67) treatment. Increased single bulb weight with increased inorganic levels was also reported by Varul et al., (1997).

There are no significantly different on bulb diameter as affected by different treatments. The highest bulb diameter 3.87 from treatment T1 followed by T3 (3.61) and T4 (3.54) treatments. Mamatha, (2006) observed the highest bulb diameter with the application of FYM + vermicompost in onion. Similar effect was also observed in bitter gourd (Samuvel, 1984). The yield was significantly influenced by different sources of nutrients. Significantly highest yield was recorded from the T1 (18.76 t/ha) treatment which was statistically similar with T4 (17.87 t/ha) and T3 (16.46 t/ha) and lowest yield was 11.88 from T5 treatment. This application increased yield by 24% compared to the control plots. Similar result was found also by Rather et al., (2003), Sharma et al., (2003), Kumar et al., (2001), Dixit (1997) and Mallanagouda et al., (1995) but Akoun (2005), Agudelo and Casierra (2004), Blay et al., (2002), Rumpelo (1998), Singh et al., (1997), and Vural et al., (1987) reported the opposite of the others.

**Table 1. Effect of organic and inorganic fertilizer in the yield of summer onion**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Plant Height (cm)</th>
<th>Leave/plant (no)</th>
<th>Single Bulb weight (g)</th>
<th>No. of bulb/kg</th>
<th>Bulb diameter (cm)</th>
<th>Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>39.57a</td>
<td>7.83a</td>
<td>20.33a</td>
<td>49.67c</td>
<td>3.87</td>
<td>18.76a</td>
</tr>
<tr>
<td>T2</td>
<td>33.67b</td>
<td>6.70ab</td>
<td>16.33bc</td>
<td>60.67bc</td>
<td>3.61</td>
<td>15.42b</td>
</tr>
<tr>
<td>T3</td>
<td>32.60b</td>
<td>6.03b</td>
<td>15.67c</td>
<td>63.67b</td>
<td>3.44</td>
<td>16.46ab</td>
</tr>
<tr>
<td>T4</td>
<td>34.17b</td>
<td>6.27b</td>
<td>19.00ab</td>
<td>55.00bc</td>
<td>3.54</td>
<td>17.87a</td>
</tr>
<tr>
<td>T5</td>
<td>27.73c</td>
<td>5.33b</td>
<td>12.00d</td>
<td>82.67a</td>
<td>2.86</td>
<td>11.88c</td>
</tr>
<tr>
<td>CV (%)</td>
<td>5.15</td>
<td>10.73</td>
<td>9.55</td>
<td>10.03</td>
<td>10.70</td>
<td>21.71</td>
</tr>
<tr>
<td>F-test</td>
<td>**</td>
<td>*</td>
<td>**</td>
<td>**</td>
<td>0.70</td>
<td>**</td>
</tr>
</tbody>
</table>

At higher level of organics, improved soil physical conditions might have resulted in better root growth, nutrient absorption and better bulb development. Increased bulb yield were noticed by several workers viz; Varul et al., (1997), Singh et al., (1997) and Lal et al., (2002) with increased FYM levels. The yield parameters like bulb equatorial diameter, polar diameter and bulb weight also increased significantly at higher levels of organics. Significantly higher bulb size was recorded by Lal et al., (2002).

Similarly, significantly higher bulb equatorial diameter due to integrated nutrient management
(INM) was recorded by Mallanagouda et al., (1995) and Varul et al. (1997). The highest gross returns of Tk.281400 was obtained with T₁, the application of (120-45-85-40 kg ha⁻¹ NPK S+ 5 t/ha CD) followed by the treatments T₄ (Tk. 268050) and T₃ (Tk. 246900).

The treatment T₁ showed maximum marginal benefit cost ratio (MBCR) 7.14 and lowest was obtained from the treatment T₂ (4.66).

Table 2. Treatment wise economics of summer onion as influenced by different manure and fertilizers

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Gross return (Tk./ha)</th>
<th>TVC (Tk./ha)</th>
<th>MVP (over control)</th>
<th>MVC (over control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>281400</td>
<td>14451</td>
<td>103200</td>
<td>14451</td>
</tr>
<tr>
<td>T₂</td>
<td>231300</td>
<td>11400</td>
<td>53100</td>
<td>11400</td>
</tr>
<tr>
<td>T₃</td>
<td>246900</td>
<td>13376</td>
<td>68700</td>
<td>13376</td>
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<tr>
<td>T₄</td>
<td>268050</td>
<td>14690</td>
<td>89850</td>
<td>14690</td>
</tr>
<tr>
<td>T₅</td>
<td>178200</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Fig.1. Marginal benefit cost ratio on summer onion production as influenced by different organic and inorganic fertilizer

Conclusions

With these results it can be concluded that higher level of inorganics i.e., T₁ (Recommended from Ph.D work) = (120-45-85-40 kg ha⁻¹ NPK S+ 5 t/ha CD), and higher levels of organics viz., T₄ and T₃ recorded higher bulb yield individually. This was reflected in growth parameters like plant height, number of leaves and Single Bulb weight as well as yield parameters. The treatment T₁ showed maximum gross return (281400 tk/ha) and lowest was obtained from the treatment T₅ (178200 tk/ha).

References


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