Effect of organic manure and inorganic fertilizer on growth yield and yield attributes in onion (Allium cepa L.) under Dhampur (Bijnor) condition

Priyanshu, Pal SL, Ravi, Shoraj Singh and Kumar Vipin

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Abstract
The present investigation on “effect of organic manure and inorganic fertilizer on growth yield, and yield attributes in onion (Allium cepa L.) cv Agrifound Light Red”, was conducted at Horticulture Research Farm, Dhampur (Bijnor) during winter season 2019-2020. The experiment was laid out in RBD with 8 treatments of organic manure and inorganic fertilizer viz; Control (T1), 100% N.P.K (T2), 100% F.Y.M (T3), 100% Neem Cake (T4), 50% N.P.K + Neem Cake (T5), 50% F.Y.M. + Neem Cake (T6), 33% N.P.K.+ F.Y.M. + Neem Cake(T7) and 50% N.P.K + F.Y.M (T8). The results showed that the growth attributes were very much fluctuated in different treatments. As far as yield characters are concerned, it was found that the treatment 50% N.P.K + F.Y.M (T8) was found superior over all other treatments studied.

Keywords: Organic manure, inorganic fertilizers, onion, yield

Introduction
Onion (Allium cepa L., 2n =16) is one of the most important bulb crop grown all over the world for its nutrients availability like carbohydrates (11gm), protein (1.2gm), calcium (180 mg), phosphorus (50 mg), iron (0.7 mg), nicotinic acid (0.4 mg), riboflavin (0.01 mg) and vitamin C (11 mg) in each 100 gm of edible portion (Bangali et al. 2012) [1]. It belongs to the family Alliacae, and originated in central Asia. It is an indispensable item in every kitchen used as salad, culinary purpose for flavouring as spices in pickles, sauce and vegetable in India. The average productivity of India is 16.3 MT/ha, which is low as compared to other onion producing countries of the world. It is cultivated in an area of 1320.13 Thousand (ha.). It is cultivated in an area of 1320.13 Thousand (ha.) Anonymous (2018) [1]. After the green revolution, production of vegetable has increased to a great extent due to use of chemical fertilizer. But their indiscriminate use led to soil. To overcome the problems of ecological imbalance and increased cost of cultivation due to continuous use of chemical fertilizer, the latest trend of growing vegetable crop by using organic manure, bio fertilizers together with inorganic fertilizer is called as integrated nutrient management (INM). The present investigation entitled “To study about the effect of organic manure and inorganic fertilizer on growth, yield and yield attributes in Rabi Onion (Allium cepa L.) Under Dhampur (Bijnor) Condition” of 2019.

Material and Methods
The field experiment was conducted Horticulture Research Centre (HRC) at R.S.M (PG) College Dhampur Bijnor Uttar Pradesh India. Geographically it is situated between 29° 17’ 27” latitude in the north and 78° 30’ 12” longitudes in the eastern elevation of about 235 m above mean sea level. The experiments were laid down in a Randomized Block Design with three replications. Agrifound Light Red variety of onion was taken for the experimentation. Total 8 treatments viz; T1- Control, T2- 100% NPK, T3- 100% FYM, T4- 100% NEEM CAKE, T5-50% NPK + 50% NEEM CAKE, T6- 50% NEEM CAKE + 50% FYM, T7 33% NPK + 33% NEEM CAKE + 33% FYM and T8- 50% NPK +50% FYM was undertaken.

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The observations on Plant height(cm), Number of leaves/plant, Height of stem (cm)/plant, Height of stem (cm)/plant, Diameter of stem (mm)/plant, Fresh bulb weight (g)/plant, Dry bulb weight (g)/plant, Dry bulb weight (g)/plant, Polar Diameter of bulb/plant (cm), Equal Diameter of bulb/plant (cm), Yield (kg)/plot, Yield q/ha, T.S.S. (°Brix) and Protein (%), were recorded during the course of experimentation. Average of data from the sampled plant of each treatment was used for statistical analyses in order to draw valid conclusions.

Results and Discussion

Results shown that treatments have wide range of variation in respect of plant height of all treatments. T8-50% FYM+NPK had maximum plant height (42.33 cm) followed by 40.70 cm in T7 (33% NPK+NC+FYM), whereas T1 (control) had minimum plant height (31.00 cm) Result shown that treatments have wide range of variation in respect number of leaves/plant for all treatments. Maximum number of leaves/plant (6.07) were found in T8-50% FYM+NPK and T7 followed by T6 (6.00), whereas T1 (control) had minimum number of leaves/plant (5.60). A wide range of variation in respect height of leaves/plant for all treatments. T8-50% FYM+NPK maximum number of leaves/plant (45.43 cm) followed by 44.33 cm in T7 (33% NPK+NC+FYM), whereas T1 (control) had minimum height of leaves/plant (38.00 cm). Height of stem/plant was found maximum in T8-50% FYM+NPK (9.40 cm) followed by 9.33 cm in T7 (33% NPK+NC+FYM), whereas T1 (control) had minimum height of stem/plant (8.40 cm). Result shown that treatments have wide range of variation in respect diameter of stem/plant for all treatments. It was observed that T8-50% FYM+NPK had maximum diameter of stem/plant (19.55 cm) followed by 15.59 cm in T7, whereas T1 (control) had minimum diameter of stem/plant (12.44 cm). Fresh bulb weight/plant was found maximum in T8-50% FYM+NPK (132.33 gm) followed by 110.63 gm in T7 (33% NPK+NC+FYM), whereas T1 (control) had minimum fresh bulb weight/plant (90 gm). The interactive influence of mineral nutrients and FYM on growth characters might be due to improved physico-chemical and biological properties like water holding capacity, hydraulic conductivity, high rate of microbial transformations due to availability of organic carbon in the form of FYM for heterotrophic organisms, buffering effect, improved soil aggregation, aeration, release of organic acid, etc. which might act as stimulant for supply of carbon in the form of FYM for heterotrophic organisms. Due to improved physico-chemical properties, all treatments showed increased growth and yield of crops as reported by Prabhakar (1992). The similar results have also been reported by Singh et al. (2014), Pandey et al. (1991) and Vachhani and Patel (1993) and Thabet et al. (1994) also revealed that there was higher release of nutrient from added sources, it was otherwise not available.

Increased levels of FYM along with combination of chemical fertilizers was found significant for fresh bulb weight, dry bulb weight, polar diameter, equal diameter, yield/plot and yield/hectare. Result shown that treatments have wide range of variation in respect of dry bulb weight/plant all treatments ranged from 64.67 to 110.67 gm. T8-50% FYM+NPK had maximum dry bulb weight/plant (110.67 gm) followed by 94.33 gm in T7, whereas T1 (control) had minimum dry bulb weight/plant (64.67 gm) at the stage of after harvesting. Result revealed that treatments have wide range of variation in respect of polar diameter/plant for all treatments. T8-50% FYM+NPK had maximum polar diameter/plant (5.65 mm) followed by 5.47 mm in T7, whereas T1 (control) had minimum polar diameter/plant (4.59 mm). Equal diameter/plant was found maximum (5.89 mm) in T8-50% FYM+NPK followed by 5.77 mm in T7, whereas T1 (control) had minimum equal diameter/plant (5.21 mm). yield/ha for all the treatment was influenced by organic, inorganic and combination of both. T8-50% FYM+NPK had maximum yield/ha (276.67 q) followed by 229.33 q in T7 (33% NPK+NC+FYM), whereas T1 (control) had minimum yield/ha (155.00 q). The beneficial response of FYM to yield might also be attributed to the availability of sufficient amount of plant nutrients throughout the growth period of crop resulting, plant vigour and yield (Prabhakar et al. 2012). The importance of FYM in improving the soil fertility and increasing growth and yield of crops have been advocated by Lallan et al. (1997) and Gupta et al. (1999). Increasing of fertility levels increased protein content and total soluble solids (TSS) in bulb of onion. 50% FYM+NPK was found superior for all the quality parameters. Result revealed that treatments have wide range of variation in respect of TSS for all treatments ranged from 8.00 to 12.67. T8 had maximum TSS (12.67) followed by 11.00 in T7, whereas T1 (control) had TSS (8.00). Protein content was affected by different treatments of organic and inorganic fertilizers. T8-50% FYM+NPK had maximum protein (1.97) followed by 1.80 in T7, whereas T1 (control) had protein (1.30). The higher nutrient contents in bulb also seem to be due to higher functional activity of root for longer duration under this treatment. The increase in N, P, K and FYM content in bulb were also observed. TSS content significantly increased with the nitrogen application nitrogen helped in vigorous vegetative growth and imparted deep green colour to the foliage which favoured photosynthetic activity of the plants so there was greater accumulation of food material i.e. carbohydrates in the bulb which synthesized to saccharides and there was increased in TSS content. The similar results have also been reported by Singh et al. (2014), Pandey et al. (1991), Vachhani and Patel (1993) and Thabet et al. (1994).

Table 1: Mean performance of onion (Allium cepa L.) cv. Agrifound Light Red by different organic and inorganic treatments

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Plant Height (cm)</th>
<th>Number of leaves (cm)</th>
<th>Height of leaves (cm)</th>
<th>Height of stem (cm)</th>
<th>Diameter of stem (cm)</th>
<th>Fresh bulb weight/ plant (gm)</th>
<th>Dry bulb weight/plant (gm)</th>
<th>Polar Diameter/plant (mm)</th>
<th>Equal Diameter/Plant (mm)</th>
<th>Yield (q/ha)</th>
<th>T.S.S. (°Brix)</th>
<th>Protein (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1-CONTROL</td>
<td>31.00</td>
<td>5.60</td>
<td>38.00</td>
<td>8.40</td>
<td>12.44</td>
<td>90.00</td>
<td>64.67</td>
<td>4.59</td>
<td>5.21</td>
<td>155.00</td>
<td>8.00</td>
<td>1.30</td>
</tr>
<tr>
<td>T2-100% NPK</td>
<td>36.33</td>
<td>5.73</td>
<td>42.67</td>
<td>8.67</td>
<td>14.90</td>
<td>94.33</td>
<td>72.33</td>
<td>5.13</td>
<td>5.43</td>
<td>165.67</td>
<td>8.97</td>
<td>1.30</td>
</tr>
<tr>
<td>T3-100% FYM</td>
<td>38.13</td>
<td>5.80</td>
<td>41.67</td>
<td>9.00</td>
<td>15.00</td>
<td>103.83</td>
<td>82.73</td>
<td>4.97</td>
<td>5.39</td>
<td>184.67</td>
<td>9.00</td>
<td>1.47</td>
</tr>
<tr>
<td>T4-100% N 5</td>
<td>38.43</td>
<td>5.87</td>
<td>40.37</td>
<td>9.20</td>
<td>14.75</td>
<td>105.67</td>
<td>84.67</td>
<td>4.89</td>
<td>5.41</td>
<td>194.33</td>
<td>9.67</td>
<td>1.60</td>
</tr>
<tr>
<td>T5-50% NPK+NC</td>
<td>38.97</td>
<td>6.00</td>
<td>43.17</td>
<td>9.27</td>
<td>15.24</td>
<td>107.3</td>
<td>88.17</td>
<td>5.39</td>
<td>5.46</td>
<td>195.33</td>
<td>10.67</td>
<td>1.67</td>
</tr>
<tr>
<td>T6-50% NC+FYM</td>
<td>40.43</td>
<td>5.73</td>
<td>43.67</td>
<td>9.27</td>
<td>15.24</td>
<td>104.60</td>
<td>88.73</td>
<td>5.42</td>
<td>5.56</td>
<td>206.00</td>
<td>10.33</td>
<td>1.80</td>
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<tr>
<td>T7-33% NPK+NC+FYM</td>
<td>40.70</td>
<td>6.07</td>
<td>44.33</td>
<td>9.33</td>
<td>15.59</td>
<td>110.63</td>
<td>94.33</td>
<td>5.47</td>
<td>5.77</td>
<td>229.33</td>
<td>11.00</td>
<td>1.80</td>
</tr>
<tr>
<td>T8-50% FYM+NPK</td>
<td>42.33</td>
<td>6.07</td>
<td>45.43</td>
<td>9.40</td>
<td>19.55</td>
<td>132.33</td>
<td>110.67</td>
<td>5.65</td>
<td>5.89</td>
<td>276.67</td>
<td>12.67</td>
<td>1.97</td>
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<tr>
<td>Mean</td>
<td>38.29</td>
<td>5.84</td>
<td>42.41</td>
<td>9.07</td>
<td>15.27</td>
<td>106.15</td>
<td>85.79</td>
<td>5.19</td>
<td>5.51</td>
<td>200.88</td>
<td>10.00</td>
<td>1.61</td>
</tr>
<tr>
<td>Minimum</td>
<td>31.00</td>
<td>5.60</td>
<td>38.00</td>
<td>8.40</td>
<td>12.44</td>
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<td>1.97</td>
</tr>
</tbody>
</table>
Conclusion

On the basis of results emanated from the present investigation that application of 50% N.P.K + 50% F.Y. improved best in respect of better growth and yield as well as for quality parameters. It is also reveal that about 25% nutrient required by onion crop could be supplemented by making effective combination of chemical fertilizer with FYM. The treatment 50% N.P.K + 50% F.Y.M were found better than the rest of the treatments for yield and most of the yield attributing characters. This treatment may be considered as guidelines for further enhancement of growth, yield and quality parameters in onion.

References