**Response of Integrated Nutrient Management on Growth, Yield and Quality attributes of Onion (*Allium cepa* L.)**

**ABSTRACT**

The present study evaluates the response of Integrated Nutrient Management on Growth, Yield and Quality attributes of Onion (*Allium cepa* L.). The farm yard manure seems to act directly for increasing crop yield by accelerating the respiratory process though cell permeability or by hormones through growth action. The experiment was conducted Rabi season of 2016-2018 at the research farm of R.B.S College Bichpuri, Agra (U.P.). The investigation comprised of all combination eight treatment of 100%RDF(T1), 100%RDF+PSB(T2),100%RDF+FYM (T3), 100%RDF+PSB+FYM(T4),80%RDF+PSB (T5), 80%RDF+FYM (T6), 80%RDF+PSB+FYM (T7), control (T8), which were replication in random block design. Treatment T4 (100%RDF+ PSB+FYM) was related as the best treatment for the majority of characteristics like height of plant, numbers of green leaves per plant, length of longest leaf, width of longest leaf, diameter of pseudo-stem, diameter of bulb, weight of bulb, bulb yield per plot, bulb yield per hectare. The significantly maximum plant height was recorded in treatment T4) followed by T3 at 30,60 and 90 DAT and up to harvest. The yield of any crop is the final index of the experiment which indicates the success of failure of any treatment with this view the bulb yield per net plot (kg)and per hectare (4.56 kg and 299.94 q ha-1) of onion was recorded in treatment T4followed by T3and which was at par with each other. Application of 100% RDF+FYM (T3) and 80% RDF + PSB+ FYM (T7) was also found next to the superior treatment i.e. T4. Thus, it may be inferred that among the integrated nutrient management 100%RDF+PSB+FYM (T4) resulted in maximum bulb yields and net profits.

**Keywords**:- Bio- fertilizer, chemical fertilizer, biological decomposition, Nutrient Management

**INTRODUCTION**

The initial years of green revolution were highly profitable to farmers, but with course of time the yield got saturated and even decreased in some areas. The application of chemical fertilizers at a massive scale reduced the inherent capacity of soil leading it to become infertile. Lower productivity of onion in India is primarily due to poor nutrient management rather than climate conditions. Hence, in concern to meet the nutrient requirement of crop and bridge the future gap integrated approach is trustworthy (Krishnaprabu, 2020; Jamir et al., 2013). Onion (*Allium cepa L*.) family Alliaceae is one of the important commercial bulbous crops cultivated extensively in India and widely used as vegetables. The chief component of pungency is allyl propyl disulphide’ of the fifteen vegetable crops listed by FAO, falls second only to tomato in terms of annual production. It is one of the few versatile vegetable crops that can be kept for a fairly long period and can safely withstand the hazards of rough handling including long-distance transport. It occupies an area of 11.67 lakh hectors with the production of 202.14 lakh MT and productivity 17.32 tones ha-1 (2015-2016). The onion crop is very much sensitive to weather fluctuations. The response of crop to nutrients and pesticides applied is also seen more in onion compared to many others crops due to which various defects are commonly observed in onion when weather condition become adverse. The crop performance varies in the crop grown in different season or indifferent areas for the same seed and many times due to unawareness of the farmers about influence of various factors on bulb development, the defects are considered to be only due to seed which is not always true (Patel et al., 2024; Singh et al., 2020).

Although India is the second largest producer of onion too, in the world next only to China but its productivity is very low 17.32 tons/ha as compared to China and other countries like, Egypt, Netherland and Iran etc. In India “Maharashtra” is the largest producer of onion contributing (5867.00 thousand MT). Followed by Karnataka,(2466.40 thousand MT).Gujarat, (1858.00).Bihar,(1304.15 thousand MT).Madhya Pradesh ,(2826.00 thousand MT) and Andhra Pradesh ,(1525.18 thousand MT). Vegetables play an important role in human health. They supply dietary fiber and are rich sources of nutrients, important for human diet. They are a particularly important source of micronutrients, pro-vitamin –A,B6,C and E as well as folic acid, iron and magnesium. The pungency in onion is due to sulphur-bearing compound in very small quantity (about 0.005%) in the volatile oil allyl propyl disulphide (C6 H12 O2). The color of the outer skin of onion bulbs is due to quercetin .The quality of onion depends on shape size, color and pungency of bulbs. Highly pungent red color onion is preferred in India while less pungent, yellow or white-skinned ones are demanded in European and Japanese market. The farm yard manure seems to act directly for increasing crop yield by accelerating the respiratory process through cell permeability or by hormones through growth action. It supplies nitrogen, phosphorus and sulphur in available form to the plants through biological decomposition. Indirectly, it improves the physical properties of the soil such as aggregation, aeration permeability and water-holding capacity (Chandramohan, 2002). Bio-fertilizers more appropriately called microbial inoculants are the preparations containing live or latent cells of efficient strains of microorganisms. These may be biological nitrogen fixer’s .Phosphorus solubilizing mineralization or nitrogen and transformation of several elements like sulphur and iron into available forms. Nutrient management is one of the most important considerations under an organic production system. The increasing cost of chemical fertilizers and their harmful effects on soil health is also an important consideration for the use of organic nutrients (Patel *et al.* 2005).

**METHODS AND MATERIALS**

The present investigation was undertaken during the rabi season of year 2016-18 for study the response of different combinations of bio- fertilizer, chemical and FYM (PSB + NPK + FYM) on the vegetative growth, and quality character of onion (Allium cepa L.). The Experiment was conducted at the Agricultural Research farm of Raja Balwant Singh college Bichpuri, Agra (U.P) The soil of the experimental field was Gangatic with a calcareous layer at a depth of about 1.0 – 1.5 meters, it was slightly alkaline in reaction pH 7.84 and well drained. Weather conditions of Agra were semi-arid sub-tropical climate with hot dry summer and hardy cold winters. Temperature falls at about 1-2℃ in winter and increases to about maximum at 45-47℃. In summer. The treatments were listed as follows:

List 1. List of treatments used for the study

|  |  |  |
| --- | --- | --- |
| **S. No** |  **Treatment** |  **Notation** |
| 1 | RDF | T1 |
| 2 | 100% RDF + PSB | T2 |
| 3 | 100% RDF +FYM | T3 |
| 4 | 100% RDF + PSB+FYM | T4 |
| 5 | 80% RDF + PSB | T5 |
| 6 | 80% RDF + FYM | T6 |
| 7 | 80% RDF + PSB + FYM | T7 |
| 8 | Control | T8 |

The eight treatments were replicated three times in randomized block design in 1.60m x 1.20 size plots. The Recommended dose of Nitrogen, Phosphorus and Potash were applied at the time of transplanting. The half dose of nitrogen was applied as basal and in two part after 30-day transplanting and 60 day after transplanting. Farm yard manure was applied 15 days before transplanting and the bio-fertilizer (PSB) was applied as seedling dipping treatment in PSB and water solution @2kg/ha. All the required cultural operations along with the irrigation are done as per the requirement of the crop. All growth studies were recorded at first 15 DAT and all 30 DAT intervals. The bulb was harvested at the mature stage.

**RESULTS AND DISCUSSION**

The pooled (2016-18) data presented in the table and figure shows the maximum length of plant. The plant height increased significantly with the different treatments of organic manures, inorganic fertilizers and bio-fertilisers up to harvesting. The significantly maximum plant height was recorded in treatment T4) followed by T3 at 30,60 and 90 DAT and up to harvest. While the minimum plant height was observed under the treatment T8 (Absolute control) for the same. This may be due to the application of integrated nutrient management, increased photosynthetic activity, chlorophyll formation, nitrogen metabolism and auxin contents in the plants which ultimately improve the plant height. These findings were in agreement with the findings of Jayathilake et al.(2002), Jayathilake et al. (2003), Abbey and Kanton (2003), Reddy and Reddy (2005), Mahmoud et al. (2006), Patel et al. (2008a).

**Table-1 Studies of Integrated Management concentrations on growth on onion.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Treatments** | **Plant height (cm)** | **Longest leaf** | **Diameter of pseudo-stem(cm)** | **Diameter of bulb(cm)** |
| T1- RDF(NPK) |  24.15 | 18.62 | 1.006 | 5.20 |
| T2- RDF+PSB |  26.01 | 20.86 | 1.12 | 5.76 |
| T3- RDF+FYM |  28.81 | 23.02 | 1.13 | 5.93 |
| T4- RDF+PSB+FYM |  29.26 | 25.96 | 1.33 | 6.43 |
| T5- RDF+PSB |  25.67 | 18.76 | 1.18 | 5.66 |
| T6- RDF+FYM |  26.37 | 19.98 | 1.003 | 5.70 |
| T7- RDF+PSB+FYM |  27.01 | 21.24 | 1.13 | 5.83 |
| T8- Control |  22.20 | 17.16 | 0.99 | 4.73 |
|  **S. Em±** | **2.29** | **1.34** | **0.062** | **0.15** |
|  **C.D. (P=0.05)** | **6.97** | **4.08** | **0.190** | **0.48** |
|  |  |  |  |  |

Fig. 1. Bar graph showing Integrated Management concentrations on the growth of onion

The Significantly maximum diameter of bulb was exhibited in the treatment T4 followed by T3 which was at par with each other. Mondal *etal.(*2004), Prabhakar *et al.(*2012).

Significant maximum bulb weight of bulb was exhibited in treatment T4 followed by T3and which were at par with each other, whereas, the minimum weight of bulb was observed in T8 (absolute control) Mahmoud (2006),

The yield of any crop is the final index of the experiment which indicates the success of failure of any treatment with this view the bulb yield per net plot (kg)and per hectare (4.56 kg and 299.94 q ha-1) of onion was recorded in treatment T4followed by T3and which was at par with each other. However, the lowest total bulb yield was recorded in treatment T8 (absolute control) Patel et al. (2008).

**Table-2 Studies of** **Integrated Management concentrations on growth yield and quality on onion.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Treatments** | **Fresh weight of bulb (gm)** | **Specific gravity of bulb** | **Fresh weight of bulb (Kg/plot)** | **Total bulb yield** **(q/ha)**  |
| T1- RDF(NPK) | 75.16 |  0.919 | 9.1 | 199.23 |
| T2- RDF+PSB | 76.8 | 1.057 | 10.2 | 227.69 |
| T3- RDF+FYM | 77.4 | 1.107 | 11.2 | 245.21 |
| T4- RDF+PSB+FYM | 80.83 | 1.722 | 13.7 | 299.94 |
| T5- RDF+PSB | 75.66 | 1.042 | 10.1 | 221.12 |
| T6- RDF+FYM | 76.66 | 1.043 | 10.4 | 223.31 |
| T7- RDF+PSB+FYM | 77.1 | 1.083 | 11.1 | 243.02 |
| T8- Control | 59.6 | 0.901 | 8.3 | 181.71 |
|  **S. Em±** | **1.46** | **0.115** | **0.259** | **17.06** |
|  **C.D. (P=0.05)** | **4.44** | **0.32** | **0.788** | **51.78** |

**Fig. 2. Bar graph showing Integrated Management concentrations on growth yield and quality on onion**

**CONCLUSION**

Based on observations and results of the present investigation, the following conclusion could be drawn, for the cultivation of onion (*Allium cepa L*.) in western Utter Pradesh plains. Integrated nutrient management had a significant effect on the growth, yield attributes and yield of onion. 100 % RDF + PSB+FYM (T4) resulted in better growth and yield attributes in terms of highest plant height, maximum number of leaves plant-1, height, leaf length, leaf width, diameter of pseudo-stem, fresh weight of tops and diameter of bulb, average bulb weight and total bulb yield (299.94 q ha-1). With respect to the economics, 100 %RDF+PSB+FYM (T4) continue to maintain its superiority in terms of higher net returns (Rs. 228768.0 ha- 1). Application of 100% RDF+FYM (T3) and 80% RDF + PSB+ FYM (T7) was also found next to the superior treatment i.e. T4. Thus, it may be inferred that among the integrated nutrient management 100%RDF+PSB+FYM (T4) resulted in maximum bulb yields and net profits.

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