

EFFECT OF DIFFERENT SOURCES OF NUTRIENTS ON GROWTH AND YIELD OF ONION (*ALLIUM CEPA* L.)

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Abstract: A field experiment was conducted during *Rabi* season 2016-17 to find out the effect of FYM and Vermi Compost with or without PSB and Azotobacter and rates of organic manures (50% and 100% RND) on growth attributes and yield parameters of onion (Agri Found Dark Red) on clay loam soil. The treatments comprised of organic, inorganic fertilizer and biofertilizers with ten treatments 100% RDF through inorganic, 100% RDF through FYM (N Basis), 100% RDF through vermicompost, 50% RDF through Inorganic Fertilizers + 50 % through FYM, 50% RDF through Inorganic Fertilizers + 50 % through vermicompost, 50% RDF through Inorganic Fertilizers + 50 % through FYM + PSB, 50% RDF through Inorganic Fertilizers + 50 % through vermicompost + PSB, 50% RDF through Inorganic Fertilizers + 25 % vermicompost + PSB, 100% RDF through FYM (N Basis) + PSB + *Azotobacter* and 100% RDF through vermicompost + PSB + *Azotobacter*. Results revealed that the application of organic manure significantly influenced the plant height (cm), number of leaves, fresh weight of leaves (g plant⁻¹) and dry weight of leaves (g plant⁻¹) with 100% RDF through Vermicompost + PSB + *Azotobacter* at 30 and 60 days of transplanting. The diameter of bulb (cm), bulb weight (g) and bulb yield (q ha⁻¹) significantly increased with 100% RDF through Vermicompost + PSB + *Azotobacter*.

Keyword: Growth, Onion, Nutrient, Yield

INTRODUCTION

Onion, *Allium cepa* L is one of the important commercial bulbous vegetable crop grown throughout the world. It is a bulbous biennial herb of the most important vegetable cum condiments, spice crops demanded worldwide. India is the second largest producer of onion in the world, next to China, with 70% of the total production comes as winter crop and remaining 30% as *kharif* onion as off season crop, accounting for 11.40 per cent of the area and 10.40 per cent of the world production and 16 per cent of productivity. In India, onion is being grown in an area of 3.64 million hectares with production of 68.45 million tonnes and the average productivity is 18.82 tonnes per hectare. Maharashtra is the leading onion growing state of India (Anonymous, 2013). Organic manures not only provide plant nutrient but also improve the soil structure by effecting soil aggregates. They also decrease EC and increase water holding capacity and phosphate availability of soils, besides improving the fertilizer use efficiency and microbial activity. Bio fertilizers play a key role in increasing the availability of nutrient. Inoculation of these bio-fertilizers in very small quantity supplemented with sufficient amount of organic matter converts the insoluble and unavailable form of nutrient in soluble and available form of nutrients. The organic manures contain nutrients in small quantities as compared to

the chemical fertilizers, also it contain growth promoting substances like enzymes and hormones, besides improvement of soil fertility and productivity. Organic materials such as poultry manure, green manures and farmyard manure (FYM) can substitute for inorganic fertilizers to maintain productivity and environmental quality.

MATERIAL AND METHOD

The experiment was conducted at the farmers field, village-Suwana, near Krishi Vigyan Kendra, Bhilwara, Maharana Pratap University of Agriculture & Technology, Udaipur, Rajasthan, India in *Rabi* season, 2016-17 to find out the effect of coinjoint use of organic and inorganic sources of nutrients on growth, yield and quality of onion (*Allium cepa* L.) var. Agrifound Dark Red. The soil of the experimental field was clay loam in texture and having pH 7.85, EC 0.11 dSm⁻¹, organic carbon content 0.42%, low in available N (178 kg/ha), medium P (18.7 kg/ha) and high in K (348 kg/ha). The experiment was laid out in randomized block design with three replications. The treatments comprised of organic, inorganic fertilizer and biofertilizers with ten treatments T₁ -100% RDF through inorganic, T₂ -100% RDF through FYM (N Basis), T₃ -100% RDF through vermicompost, T₄ - 50% RDF through Inorganic Fertilizers + 50 % through FYM, T₅ -50% RDF through Inorganic

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Fertilizers + 50 % through vermicompost, T₆ -50% RDF through Inorganic Fertilizers + 50 % through FYM + PSB, T₇ -50% RDF through Inorganic Fertilizers + 50 % through vermicompost + PSB, T₈ -50% RDF through Inorganic Fertilizers + 25 % vermicompost + PSB, T₉ -100% RDF through FYM (N Basis) + PSB + *Azotobacter* and T₁₀ -100% RDF through vermicompost + PSB + *Azotobacter*.

The treatments of manure, chemical fertilizers and bio-fertilizers were applied as per treatment in respective plot. Vermicompost and FYM were applied prior to 15 days of transplanting of Onion. PSB and *Azotobacter* bio-fertilizer was applied at the time of transplanting. Inorganic fertilizer *i.e.* SSP and Murate of Potash were applied as a basal dose during transplanting whereas as 1/2 dose of urea was applied at the time of transplanting and remaining 1/4 – 1/4 dose applied at 30 and 60 days of transplanting respectively. The seeds of onion variety “Agrifound Dark Red” were treated with bavistin + carbandazim (SAAF) @ 3 gm kg⁻¹ before sowing in nursery. The seed of onion variety Agrifound Dark Red was raised in the nursery of 3 m long and 1.2 m wide and 10 cm above the ground level was prepared and manured as per the recommendation treatments. Treated seed were sown on 22 December 2016 in line and all the intercultural operations were done as and when required. 57 days old seedlings of uniform size were transplanted on 14 February 2017 in the prepared field. The spacing 15 cm row to row and 10 cm plant to plant was maintained. The seedlings were transplanted in cool evening according to the layout plan. A light irrigation was applied just after the transplanting and subsequent irrigation was given at an interval of 10-12 days depending upon the soil condition. Harvesting of onion was done on 31st May 2017.

The data on plant height (cm), number of leaves per plant⁻¹, fresh weight of leaves, dry weight of leaves parameters were recorded at 30 and 60 DAT, whereas diameter of bulb (cm), average bulb weight (g) and bulb yield (q ha⁻¹) were recorded and thereafter, tabulated and analyzed statistically by method of analysis of variance. The data were analyzed statistically and result was interpreted by using methods suggested by Panse and Sukhatme (1967).

RESULT AND DISCUSSION

Growth parameters

The vegetative parameters like plant height (cm), number of leaves plant⁻¹, fresh weight of leaves, dry weight of leaves parameters were recorded at 30 and 60 DAT, were greatly influenced by both organic and inorganic nutrient sources. The plant height increased significantly with the different treatments of organic manures, inorganic fertilizers and bio-fertilizer up to harvesting (Table1). This may be due to application of nutrient management through vermicompost along with bio-fertilizers, increased the photosynthetic activity, chlorophyll formation, nitrogen metabolism and auxin contents in the plants which ultimately improving the plant height. These findings were in agreement with the findings of Prabhakar *et al.* (2012). The significantly maximum leaves per plant was recorded in the treatments T₁₀ (100% RDF through Vermicompost + PSB + *Azotobacter*) at 30 and 60 days of transplanting followed by T₉ (100 % RDF through FYM + PSB + *Azotobacter*). However, the minimum leaves per plant was recorded under treatment T₂ (100 % RDF through FYM) at 30 and 60 DAT. Probable reasons for enhanced more number of leaves may be due to promotive effects of integrated nutrient management on vegetative growth which ultimately lead to more photosynthetic activities. These findings was in agreement with the findings of Jawadagi *et al.* (2012). The fresh weight of leaves was significantly influenced by various treatments of organic manures, inorganic fertilizers and bio-fertilizer. Similar results reported by Mahanthesh *et al.* (2005). Similarly, significantly maximum dry weight of leaves was exhibited in the treatment T₁₀ (100% RDF through Vermicompost + PSB + *Azotobacter*), followed by T₇ (50 % RDF through Inorganic Fertilizers + 50 % through Vermicompost + PSB). However, the minimum dry weight of leaves was observed in T₂ (100 % RDF through FYM). This may be due to application of major and micro nutrients by organic manure which increased the photosynthetic activity, chlorophyll formation, nitrogen metabolism and auxin contents in the plants which ultimately improving the dry weight of leaves.

Table 1. Effect of different organic and inorganic sources and their combinations on growth parameters of onion.

| Treatment | Plant height | | Number of leaves | | Fresh weight of leaves (g/plant) | | Dry weight of leaves (g/plant) | |
|--|--------------|--------|------------------|--------|-------------------------------------|--------|-----------------------------------|--------|
| | 30 DAT | 60 DAT | 30 DAT | 60 DAT | 30 DAT | 60 DAT | 30 DAT | 60 DAT |
| T ₁ - 100 % RDF through Inorganic Fertilizers | 21.33 | 38.67 | 5.00 | 8.20 | 22.67 | 40.80 | 3.27 | 5.37 |
| T ₂ - 100 % RDF through FYM (N basis) | 17.40 | 36.67 | 4.80 | 7.84 | 21.67 | 39.00 | 3.20 | 5.00 |

| | | | | | | | | |
|--|-------|-------|------|-------|-------|-------|------|------|
| T ₃ - 100 % RDF through Vermicompost (N basis) | 19.77 | 37.77 | 5.09 | 8.29 | 26.00 | 46.80 | 3.83 | 5.97 |
| T ₄ - 50 % RDF through Inorganic Fertilizers + 50 % through FYM | 20.07 | 38.07 | 5.60 | 8.80 | 25.67 | 47.80 | 3.75 | 6.00 |
| T ₅ - 50 % RDF through Inorganic Fertilizers + 50 % through Vermicompost | 19.27 | 37.27 | 5.53 | 8.73 | 29.67 | 53.40 | 4.40 | 6.67 |
| T ₆ - 50 % RDF through Inorganic Fertilizers + 50 % through FYM + PSB | 22.83 | 43.00 | 5.97 | 9.20 | 28.00 | 47.60 | 4.10 | 5.97 |
| T ₇ - 50 % RDF through Inorganic Fertilizers + 50 % through Vermicompost + PSB | 25.47 | 45.13 | 5.87 | 9.13 | 29.67 | 53.40 | 4.45 | 6.62 |
| T ₈ - 50 % RDF through Inorganic Fertilizers + 25 % Vermicompost + 25 % FYM + PSB | 24.07 | 42.07 | 5.27 | 10.32 | 29.17 | 52.50 | 4.20 | 6.69 |
| T ₉ - 100 % RDF through FYM + PSB + <i>Azotobacter</i> | 25.00 | 46.33 | 6.20 | 11.34 | 29.50 | 52.30 | 4.32 | 6.83 |
| T ₁₀ - 100 % RDF through Vermicompost + PSB + <i>Azotobacter</i> | 28.67 | 52.00 | 6.93 | 12.63 | 34.33 | 60.53 | 5.05 | 7.69 |
| SEm± | 0.93 | 1.17 | 0.13 | 0.23 | 1.57 | 2.42 | 0.24 | 0.39 |
| C.D. (5%) | 2.77 | 3.47 | 0.38 | 0.67 | 4.66 | 7.20 | 0.72 | 1.15 |

Post-harvest parameter of crop

Diameter of bulb increased significantly with different treatments of organic manures, inorganic fertilizers and biofertilizer (Table2). This may be due to application of organic manures which provide major and micro nutrients resulted in increased the photosynthetic activity, chlorophyll formation, nitrogen metabolism and auxin contents in the plants which ultimately improving the diameter of bulb.

Significantly maximum bulb weight of bulb was exhibited in the treatment T₁₀ (100% RDF through Vermicompost + PSB + *Azotobacter*) followed by T₉ (100 % RDF through FYM + PSB + *Azotobacter*), Bulb yield per hectare differed significantly due to application of 100% RDF through Vermicompost + PSB + *Azotobacter* significantly increased the bulb yield of onion. The higher yield might be due to

increase in plant height, number of leaves, and other yield attributes viz., fresh weight of whole plant, fresh and dry weight of bulb. Similar results have been reported by Shinde *et al.* (2013) and Gurjar *et al.* (2017) .

CONCLUSION

The results of present investigation revealed plant height (cm), number of leaves, fresh weight of leaves (g plant⁻¹) and dry weight of leaves (g plant⁻¹) were significantly influenced with 100% RDF through Vermicompost + PSB + *Azotobacter* at 30 and 60 days of transplanting. The diameter of bulb (cm), bulb weight (g) and bulb yield (q ha⁻¹) significantly increased with 100% RDF through Vermicompost + PSB + *Azotobacter*).

Table 2. Effect of different organic and inorganic sources and their combinations on yield and quality parameters of onion.

| Treatment | Diameter of bulb (cm) | Average weight of bulb (g) | Bulb yield (Q/ha) |
|---|-----------------------|----------------------------|-------------------|
| T ₁ - 100 % RDF through Inorganic Fertilizers | 5.78 | 81.00 | 137.70 |
| T ₂ - 100 % RDF through FYM (N basis) | 5.98 | 85.17 | 144.78 |
| T ₃ - 100 % RDF through Vermicompost (N basis) | 6.37 | 93.69 | 159.28 |
| T ₄ - 50 % RDF through Inorganic Fertilizers + 50 % through FYM | 6.64 | 94.53 | 160.71 |
| T ₅ - 50 % RDF through Inorganic Fertilizers + 50 % through Vermicompost | 7.03 | 104.00 | 176.80 |

| | | | |
|--|------|--------|--------|
| T ₆ - 50 % RDF through Inorganic Fertilizers + 50 % through FYM + PSB | 7.33 | 109.00 | 185.30 |
| T ₇ - 50 % RDF through Inorganic Fertilizers + 50 % through Vermicompost + PSB | 7.36 | 113.00 | 192.10 |
| T ₈ - 50 % RDF through Inorganic Fertilizers + 25 % Vermicompost + 25 % FYM + PSB | 7.20 | 117.17 | 199.18 |
| T ₉ - 100 % RDF through FYM + PSB + <i>Azotobacter</i> | 7.75 | 120.00 | 204.00 |
| T ₁₀ - 100 % RDF through Vermicompost + PSB + <i>Azotobacter</i> | 8.77 | 129.08 | 219.44 |
| SEm± | 0.32 | 1.27 | 2.16 |
| C.D. (5%) | 0.96 | 3.77 | 6.40 |

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