EFFECT OF NUTRIENT MENAGEMENT on GROWTH, YIELD AND QUALITY OF ONION (*Alium cepa* L.)

ABSTRACT

A field experiment was conducted on the Horticulture Research Farm of the RBS College, Bichpuri, Agra during the *rabi* season of 2016-18. In this experiment eight treatments were tested with three replications in randomized block design (RBD). Treatments were (T1) recommended dose of fertilizer (RDF) (T2) 100% RDF + Azotobacter, (T3) 100% RDF + FYM, (T4) 100% RDF + Azotobacter + FYM, (T5) 80% RDF + Azotobacter + FYM, (T6) 80% RDF + FYM, (T7) 80% RDF + Azotobacter and (T8) control. The application of 100%RDF +Azotobacter + FYM (T4) significantly maximum plant height (50.14cm), maximum number of green leaves (8.65), maximum leaf length(45.53cm). maximum fresh weight of top of plant 45.34gm), maximum fresh weight of bulbs (84.32gm), maximum diameter of bulb (6.9cm) and the highest bulb yield of 33.95 t/ha. were recorded from treatment T4 (100%RDF +Azotobacter + FYM)

Key words: Nutrient management, Azotobacter, farm yard manure (FYM), yield and quality, onion (*Allium cepa* L.).

INTRODUCTION

Onion (*Allium cepa* L.) is the most important commercial vegetable and spice crop cultivated extensively in India. The primary center of origin is Central Asia (Vavilove 1951). It belongs to Amaryllidaceae family having 2n = 16 chromosome number, biennial herb type plant with tabular leaves and bulbs are formed by the attachment of swollen leaf bottom to underground part of stem, which is small and rudimentary. Its flower type is ‘umbel,’ which have many small flowers. This is cross pollinated crop. Onion has many medicinal properties like anti-flatulence and cure dysentery, reducing cholesterol levels, it may help in reducing high blood pressure and also useful to prevent hair fall. India is second largest producer of the world. The randomly use of chemicals results in bad soil health, erosion loss of organic matter, nitrate pollution and also health hazard from human beings. The bio- fertilizers are alternative source to meet the requirement of crops and to bridge the further

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gaps and also get the sustainable production and productivity as well as quality. Azotobacter is an inorganic fertilizer and it is free living, aerobic nitrogen fixing and non-symbiotic bacteria. It fixes about 20 kg/ha atmospheric nitrogen in the roots of the many crops like vegetables, spices and condiments besides the pulses and enhance the germination (Sethi and Adhikary 2012). FYM is basically made by decomposition of animal dung, urine other dairy waste, dry leaves and straw waste. Farm yard manure have all macro and micro nutrients having 0.5 % N, 0.2% P_2O_5 0.5%-K_2O. To reducing uses of chemical fertilizer in the soil, to save soil health and promote crop quality, longevity of soil, FYM is very affective. FYM less expensive than chemical fertilizers. Just few researchers namely Banjare *et. al.* (2015) and Talwar Dilpreet *et. al*. (2016) studied in this regard to find out the effect of nutrient management with bio-fertilizers on the onion crop. However, till now no systematic approaches are available so far made to utilize the agro-ecological condition of Gangatic plains of Uttar Pradesh and small information is available about the organic cultivation of this crop in the country. Therefore, it was considered worthwhile to carry out the present investigation on the growth yield and quality of onion cv.–Agree found light red (AGFR) under Gangatic alluvial soil condition of Uttar Pradesh.

METHODS AND METERIALS

The present investigation was under taken during the *rabi* season of year 2016-17 and 1017-18 for study the response of different combinations of bio- fertilizer, chemical and FYM (Azotobacter + NPK + FYM) by the vegetative growth, and quality character of onion (*Allium cepa* L.). 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 calcareous layer at the depth of about 1.0 – 1.5 meters, it was slightly alkaline in reaction pH 7.84 and well drained. Weather conditions of Agra was semi-arid sub-tropical climate with hot dry summer and hardy cold winters. Temperature falls at about 1-2-℃ in winter and increased about maximum at 45-47℃. in summer. The treatments were (T1) Recommended dose of fertilizer(RDF) (T2) 100% RDF + Azotobacter (T3) 100% RDF + FYM, (T4) 100% RDF + Azotobacter + FYM, (T5) 80% RDF + Azotobacter + FYM,

(T6) 80% RDF + FYM, (T7) 80% RDF + Azotobacter and (T8) control. The eight treatments were replicated three times in randomized block design in 1.60m x 1.20m 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 parts after 30 and 60-days after transplanting(DAT). farm yard manure was applied 15 days before transplanting and the bio-fertilizer (Azotobacter) was applied as seedling dipping treatment in Azotobacter and water solution at 2kg/ha. All the required cultural operations along with the irrigation was done as per requirement of the crop. The all growth studies recorded at 15 and 30 DAT. The bulb was harvested at the mature stage. The experimental site is gangatic alluvial in origin with calcareous layer at the depth of about 1.5m -2m, it was slightly alkaline in reaction (pH 7.84). The soil pf experimental field is deficient in total nitrogen, low in organic carbon, medium in phosphorus and rich in potash.

RESULTS AND DISCUSSION

The pooled data of length of plant presented in table and figure shows that maximum length of plant was 23.59, 39.98, 50.14 and 23.34cm at 30, 60, 90 DAT, respectively and at harvest were found to be significantly higher in T4 (100% RDF + Azotobacter + FYM), which was significantly followed by T3 (100% RDF + FYM) and T5 (80 % RDF + Azotobacter + FYM), the lower height of plant was observed in T8 (control). These finding are in agreement with the findings of Jawadagi *et. al*. (2012) and Kurrey *et. al*. (2018).

Number of green leaves at 30, 60, 90, DAT and at harvest were found to be significantly maximum in T4 (100% RDF + Azotobacter + FYM) that was closely followed by T3 (100% RDF + FYM) and the lowest number of green leaves per plant was observed in T8. The possible reason for increased number of green leaves per plant may be due to the improvement in growth related attributes because of certain promoting substances secreted by bio-fertilizers and better uptake of water.

Leaf length is one of the important characters for determining crop vigour and yield. In the present study all the inorganic + bio-fertilizer + organic manure combination treatments were significantly superior to other. The maximum length of longest leaf at 30, 60, 90, DAT and at harvest were found to be significantly higher in T4 (100% RDF +Azotobacter + FYM) which, was followed by T3. (100% RDF + FYM) and T5 (80% RDF +Azotobacter + FYM) whereas, the minimum leaf length was recorded in control (T8).Similar results were observed by Meena *et. al*. (2015) and Tinna *et. al*.(2020)

The width of longest leaf at 30, 60, 90, DAT and harvest were found to be significantly higher in (T4) 100% recommended dose of fertilizer with the organic manure/ substance and bio-fertilize. Increases in width of leaf with optimum level of chemical fertilizer with organic manures could be due to good growth of plant that enhanced by the production of bio active substance having similar effects as that the growth regulator besides nitrogen fixation through bacterial fertilizers. Similar result observed by Singh *et al*. (2015)

Considerable variation in fresh weight of the above parts of plant with T4 (100% RDF +Azotobacter + FYM) might be attributed due to the improvement in overall growth and development of plants as led to higher (45.34gm) fresh weight of top of plant and lower (38.31gm) fresh weight was in control (T8). This enabled the plant to draw more nutrients from soil for proper growth and development as stated by Talwar *et al.* (2012) .

Significantly higher bulb diameter was noted under T4 (100% RDF + Azotobacter + FYM) and lower was found in control (T8).Similar results observed by Brinjh *et al*. (2014).

Average bulb weight was also recorded maximum in the bulbs receiving 100% RDF +Azotobacter + FYM (T4) followed by 100% RDF + FYM (T3). The increases in the bulb weight could be due to the increased uptake of nutrients and buildup of sufficient photosynthesis enabling the increases in size of bulbs ultimately resulting in the increased averaged bulb weight. These results are in confirmation with the finding of Yogita *et al.* (2012)and Kumar *et al.* (2019).

The maximum specific gravity of bulb (1.626) was in the treatment T4 (100% RDF + Azotobacter + FYM) followed by T5 (80%RDF + Azotobacter + FYM) (1.107) and minimum (0.89) specific gravity was also observed in T7(100% RDF + Azotobacter).Similar results noted by Bhagwat *et. al*. (2016)

The main and important objective of any production is to have maximum crop yield for better returns. The data regarding bulb yield reveals a significant difference among the different treatments. The maximum bulb yield/plot and hectare (5.17 kg and 339.58q) respectively, was obtained in T4 (100% RDF

+Azotobacter + FYM) that was statistically at par with T3 and T5 and minimum was noticed inT8. The increase in yield may be due to more number of bulbs per plot, bulb size and average weight of bulb. Use of Azotobacter and FYM, not only makes the atmospheric N available to plants but also enhances the plant growth and bulb yield to release hormones, vitamins and nutrient. Similar findings were also reported by Talwar *et al. (*2012) and (Afify *et al*. 2018).

COCLUISON

All the inorganic, organic and bio-fertilizers combination of treatments were found statically better on performance of onion, on the basis of experiment conducted, it is concluded that the treatment T4 (100% RDF + Azotobacter + FYM) was found superior among all other treatments for growth, yield and quality characters of onion. Further trial of this research work in different location of the Uttar Pradesh are needed to recommended results at farmer's level.

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Table 1: Effect of nutrient management on the growth attributed of onion

Treatment	Plant height (cm)	No. of leaves /plant	Length **o**f leaf	Width of leaf (cm)	Diameter of pseudo-stem(cm) (cm)	Weight. of tops (gm)
T_1	43.53	6.55	38.23	1.51	1.43	41.73
T_2	44.31	6.66	39.66	1.65	1.30	41.85
T_3	47.85	7.66	42.46	1.88	1.53	43.65
T_4	50.14	8.65	45.53	2.00	1.76	45.34
T_5	46.25	7.55	41.10	1.82	1.33	42.56
T_6	44.53	7.22	40.36	1.73	1.30	42.18
T_7	41.3	6.11	37.25	1.44	1.30	41.34
T_8	39.52	5.88	33.96	1.28	1.20	38.31
S.Em±	0.656	0.193	0.330	0.051	0.708	0.714
CD(P=0.05)	5.97	0.588	1.00	0.155	0.214	2.16

Table 2: Effect of nutrient management on the yield and quality attributes of onion

Treatment	Bulb Diameter (cm)	Weight of bulb (gm)	Bulb yield qt/ha	Specific gravity
T_1	4.05	68.32	222.67	1.08
T_2	4.21	71.57	250.93	1.04
T_3	4.93	82.05	301.48	1.05
T_4	5.21	84.32	339.58	1.62
T_5	4.96	80.13	282.43	1.10
T_6	4.47	77.13	268.64	1.04
T_7	4.60	66.68	218.72	0.89
T_8	4.04	63.40	193.13	0.919
S.Em±	0.246	1.27	30.85	0.105
CD(=0.50)	0.747	3.88	93.59	0.319

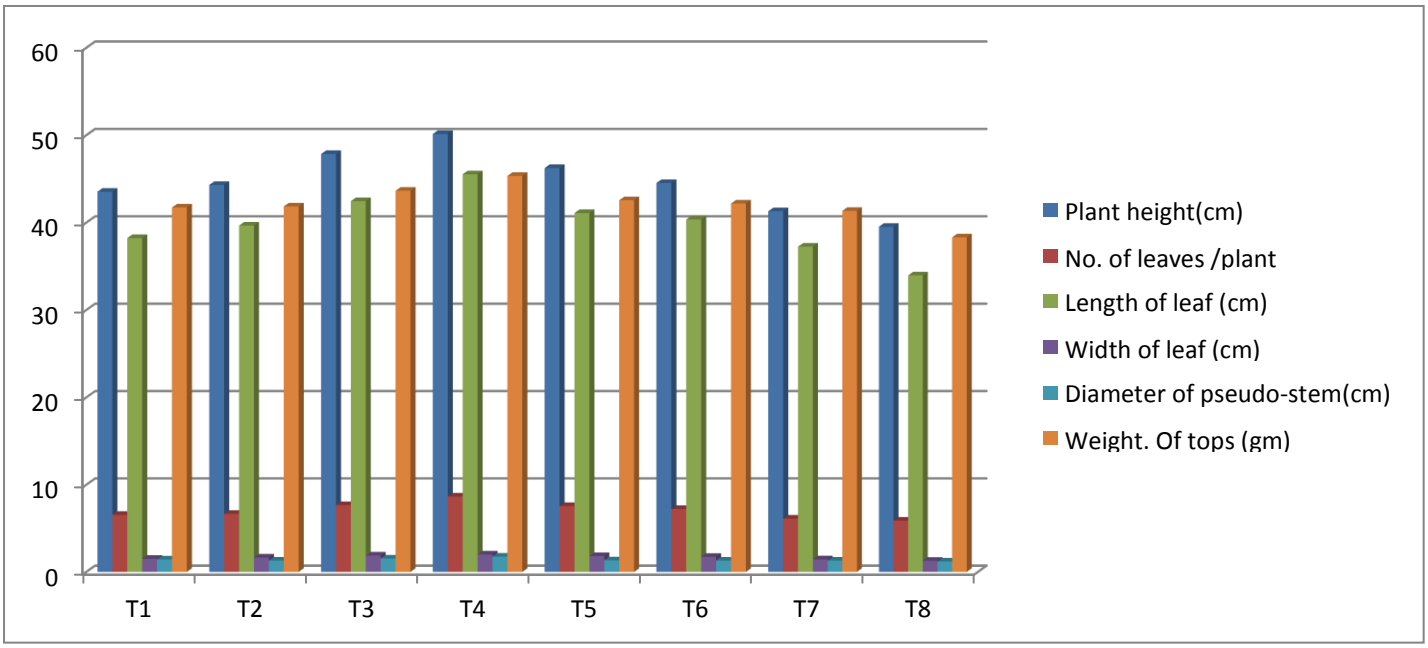

Fig. 1: Effect of nutrient management on the vegetative growth of onion

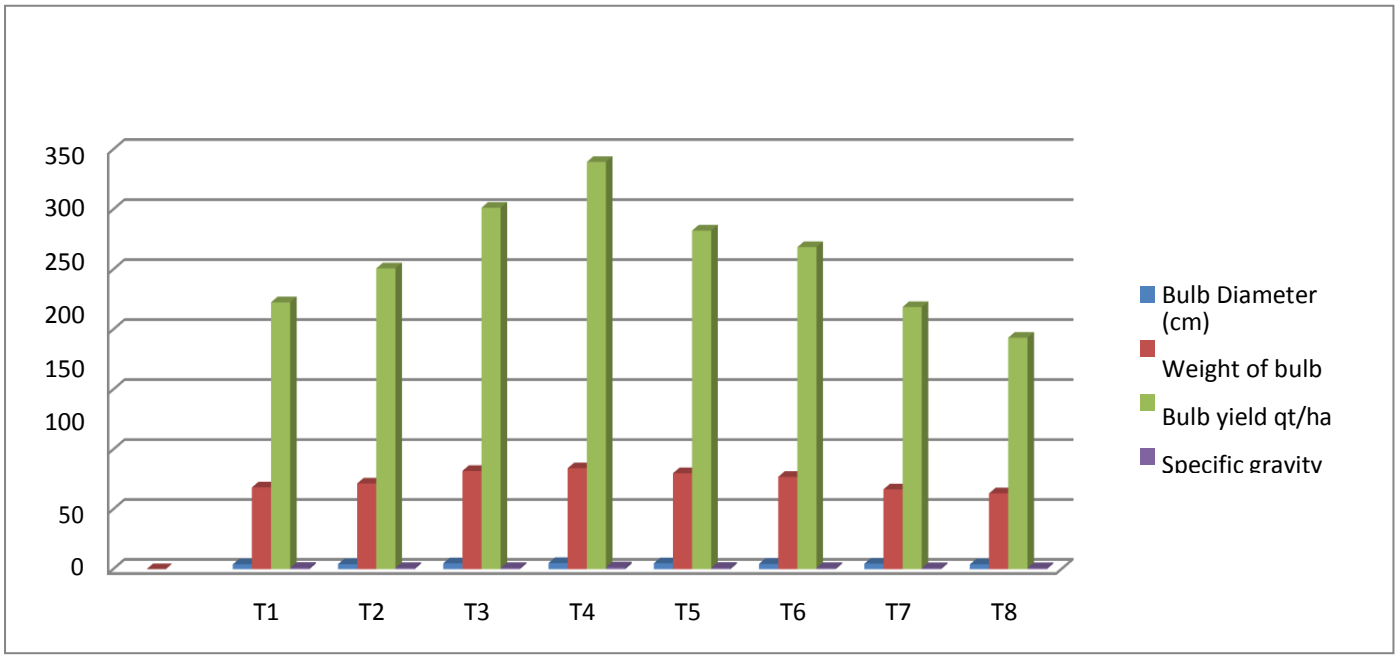

Fig. 2: Effect of nutrient management on the vegetative growth of onion