RESPONSE OF VERMICOMPOST AND PSB ON THE VEGETATIVE GROWTH AND YIELD OF ONION (*Allium cepa L.*)

ABSTRACT

A field experiment was conducted during rabi season of 2020-21 at research farm R.B.S. College, Bichpuri, Agra (U.P) to study the "Response of Vermicompost and PSB on the vegetative growth and yield of onion (*Allium cepa l.*)" there were 7 treatment combinations in field layout with randomized block design. T_1 100% RDF (Control), T_2 80% RDF+PSB (5kg/ha.), T_3 80% RDF+VC, T_4 80% RDF+VC+ PSB (5kg/ha.), T_5 100 %RDF+PSB (5kg/ha.), T_6 100% RDF+VC (5kg/ha.) and T_7 100% RDF+VC+ PSB (5kg/ha.). which ware replicated thrice On the basis of experiment conducted that the treatment T_7 i.c, application 100% RDF+VC+ PSB (5kg/ha.) was found superior among the treatments for growth and yield of onion, the maximum bulb yield (332.64 q/ha) was obtained by application of treatment T_7 100% RDF+VC+ PSB (5kg/ha.).

Keywords: Nitrogen, Phosphorus, Potassium, Vermicompost, PSB and Onion

INTRODUCTION

Onion (*Allium cepa* L.) herbaceous biennial plant in the amaryllis family (Amaryllidaceae) grown for its edible bulb is one of the most important vegetable crop commercially grown in the world. The word "onion" is derived from Latin language means "large pearl". It probably originated from Central Asia between Turkmenistan and Afghanistan. The crop onion is a popular vegetable and its bulb is used raw, sliced for seasoning salads, and cooked with other vegetables and meat. Onion bulbs are essential ingredients in many African sauces and dishes. The leaves, whole immature plants called 'salad onion' or leafy sprouts from germinating bulbs are used in the same way. Onion contains carbohydrates (11.0 g), fiber (0.6 g), moisture (86.8 g) and several vitamin like vitamin C (11 mg), thiamin (0.08 mg) and niacin (0.2 mg) and also some minerals like phosphorus (39 mg), calcium (27 mg), sodium (1.0 mg), iron (0.7 mg) and potassium (157 mg) per 100 g. Amongst bio-fertilizers, PSB strains play a key role in harnessing the atmospheric phosphorus through its fixation in the roots. They have solubilizing inorganic phosphorus from insoluble compounds.P-solubilization ability of rhizosphere microorganisms is considered to be one of the most important traits associated with plant phosphate nutrition. Vermicompost(VC) has large particulate surface area that provides many micro sites for the microbial activity and strong

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retention of nutrients. Vermicompost also contains large amounts of humus substances and some of the effects of these substances on plant growth have been shown to be very similar to those of soil applied plant growth regulators or hormones. As a result, most nutrients are easily available such as; nitrates, phosphates, and exchangeable calcium and soluble potassium, which are responsible for increased plant growth and crop yield.

METHODS AND MATERIALS

The field experiment was conducted at the RBS College, Agricultural Research Farm, Bichpuri (Agra), which is situated at an elevation (altitude) of 168 m above mean sea level, 27.2^0 N latitude and 77.9^0 E longitude. Bichpuri farm is located at about 11 km. away from Agra city on Agra-Bharatpur Road, in semi-arid region IV (AESR 4.1) and Agro-climatic Zone 'NWPZ' (North Western Plains Zone)

Agra enjoys semi-arid, sub-tropical climate with extremes of temperature both in winter and summer. The winter (December to January) is severe cold with minimum temperature at two degree Celsius (1-2^0C) and in summer (May-June) the temperature often goes up to 46^0-48^0C accompanied with hot desiccating winds. The details of different treatments using in experiment are given below

T_1	100% Recommended dose of fertilizer (Control)
T_2	80% RDF+ Phosphate solubilizing bacteria (5kg/ha.)
T_3	80% RDF+Vermicompost
T_4	80% RDF+VC+ PSB (5kg/ha.)
T_5	100 %RDF+PSB (5kg/ha.)
T_6	100% RDF+VC (5kg/ha.)
T_7	100% RDF+VC+ PSB (5kg/ha.)

RESULTS AND DICSUSSION:

The pooled data regarding vegetative growth and yield of onion were presented in Table-1 and Table-2. The data Table-1 indicated that the T_7 (100%RDF+VC+PSB) treatment had the maximum fresh weight of tops (22.78gm) at harvest which was significantly at par with T_6 treatment where as minimum fresh weight of topes (18.43gm) was recorded in T_1 (100% RDF) treatment in this parameter. The data also indicated that the T_7 (100%RDF+VC+PSB) treatment had the maximum fresh weight of bulb (80.71 gm) at harvest which was superior to all other treatments however,

treatment T_6 was statistically at par with T_7 while minimum fresh weight of bulb (65.78 gm) was obtained with T_1 (100% RDF). Diameter of bulb at harvest presented in the table showed that the treatment (100%RDF+VC+PSB) T_7 produced (6.43cm) significantly maximum diameter of bulb followed by T_6 which was statistically at par to each other. However rest of all treatments statistically less than T_7. The results are in agreement with the work of Yogita *et al.* (2012) and Kumar *et al.* (2010). The significantly maximum Plant height at 30,60 and 90 DAT was recorded with the treatment T_7 [100%RDF+VC+PSB (each 5kg/ha.)]. which was closely followed by T_5 and T_6 at 30,60 and 90 DAT. However the minimum plant height was noted under the treatment T_1 (100% RDF) at 30, 60 and 90 DAT. Possible reason for increased height of plant may be due to the improvement in growth related attributes because of certain growth promoting substances secreted by bio-fertilizers, better uptake of water, nutrients and their transportation. Similar studies were also conducted by mandal *et. al.* (2013) and Bringh *et. al.* (2014) in onion crop. The maximum bulb yield per plot and per hectare (6.28kg and 332.64q, respectively) was recorded in treatment [100%RDF+VC+PSB (each 5kg/ha.)] T_7 which was statistically at par with T_5 and T_6.Whereas, the minimum bulb yield (3.59 kg/plot) and (190.56q/ha) was obtained in T_1. This increase may be due to more number of bulbs per plot, bulb size and average weight of bulbs. Number of leaves per plant and diameter of pseudo-stem (cm) were appreciably higher with treatment T_7 [100%RDF+VC+PSB (each 5kg/ha.)] over all other treatments. Significantly maximum diameter of Onion bulb was found in treatment T_7 [100%RDF+VC+PSB (each 5kg/ha.)] while the minimum was noted with T_1 at 90 DAT and harvest stage.

Table-1 Effect of Fresh weight of tops (gm), Fresh weight of bulb and Diameter of bulb (cm)

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Treatment	Plant height (cm)	No. of green leaves per plant	Fresh weight of tops (gm)	Fresh weight of bulb (gm)	Diameter of bulb (cm)
100% RDF(control)	39.76	5.97	18.43	65.78	4.96
80% RDF+PSB	44.11=	6.32	20.45	76.03	5.76
80% RDF+VC	44.11	6.50	20.91	76.35	5.83
80% RDF+VC +PSB (each 5kg/ha.)	41.29	6.10	19.2	75.20	5.27
100% RDF +PSB	42.1	6.30	20.17	75.35	5.67
100% RDF+VC	46.82	6.93	22.6	77.83	6.09
100%RDF+VC+PSB (each 5kg/ha.)	48.14	7.40	22.78	80.71	6.43
S.Em±	**0.78**	**0.21**	**0.48**	**1.13**	**0.13**
C.D.(P=0.05)	**2.35**	**0.64**	**1.15**	**3.39**	**0.39**

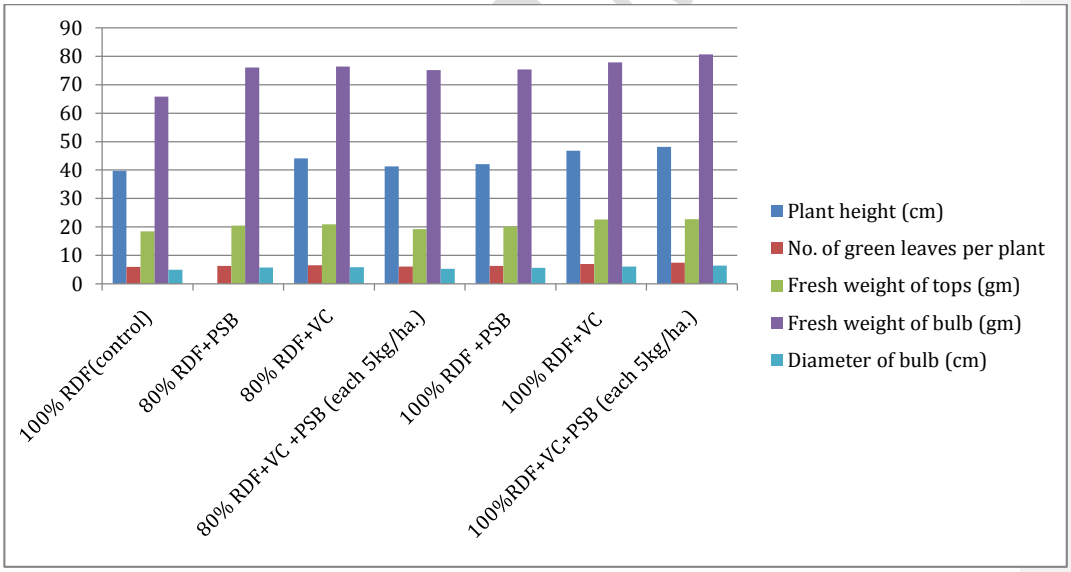

Fig. 1 Effect of Fresh weight of tops (gm), Fresh weight of bulb and Diameter of bulb (cm)

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Table 2- Effect of Fresh weight of bulb (kg/plot), Dry matter content of bulb (%) and Total bulb yield (q/ha).

Treatment	**Fresh weight of bulb (kg/plot)**	**Dry matter content of bulb (%)**	**Total bulb yield (q/ha)**
100% RDF(control)	3.59	9.78	190.56
80% RDF+PSB	4.30	10.45	228.12
80% RDF+VC	4.43	10.67	234.64
80% RDF+VC +PSB (each 5kg/ha.)	3.76	10.12	199.23
100% RDF +PSB	3.91	10.47	207.23
100% RDF+VC	5.96	10.91	315.94
100%RDF+VC+PSB (each 5kg/ha.)	6.28	11.05	332.64
S.Em+	**0.26**	**1.01**	**8.06**
C.D.(P=0.05)	**0.78**	**NS**	**24.17**

The maximum fresh weight of bulb was obtained with the application of treatment T_7 [100%RDF+VC+PSB (each 5 kg/ha.)], which was significantly higher over rest of the treatments. Application of treatment T_7 [100%RDF+VC+PSB (each 5kg/ha.)] gave maximum Dry matter content of bulb (8.97%) which was considerably higher over rest of the treatments.

CONCLUSION

On the basis of present investigation, following conclusions were drawn: maximum bulb yield (332.64) Q ha^{-1} was obtained by application of treatment T_7 [100%RDF+VC+PSB (each 5kg/ha.)]. On the basis of experiment conducted, it is concluded that the treatment T_7 i.e., application of [100%RDF+VC+PSB (each 5kg/ha.)] was found superior among all other treatments for growth and yield characters of onion. maximum bulb yield (332.64) Q ha^{-1} was obtained by application of treatment T_7 [100%RDF+VC+PSB (each 5kg/ha.)]

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REFERENCE

Aswani G, Paliwal R and Sarolia D K. (2005) Effect of nitrogen and biofertilizer on yield and quality of rabi onion (*Allium cepa* L.) cv. Puna Red. *Agricultural Science Digest* **25** (2):124-126

Brinjh S, Kumar S, Kumar D and Kumar M. (2014) Effect of integrated nutrient management on growth, yield and quality in onion cv. Pusa Madhvi. *Plant Archives* **14**(1): 557-559

Brinjh S, Kumar S, Kumar D and Kumar M. (2014) Effect of integrated nutrient management on growth, yield and quality in onion cv. Pusa Madhvi. *Plant Archives* **14**(1): 557-559

Ghanti S and Sharangi A B. (2009). Effect of biofertilizers on growth, yield and quality of onion cv. Sukhsagar. *Journal of Crop and Weed* **5**(1): 120-123

Khang V T., Patil H M and Gudedhe N N. (2019) Effect of integrated nutrient management on onion yield and soil properties in soybean-onion cropping sequence. *Omonrice* **18**: 112-120

Kumar J., Singh O and Krishan P. (2010) Response of biofertilizers and chemical fertilizers in onion (*Allium cepa* L.). *Progressive Agriculture* **10**(1): 170-172

Mandal J., Ghosh C and Chattopadhyay G N. (2013) Proportional substitution of Chemical fertilizers with Vermicompost on growth and production potential of onion (*Allium cepa* L.). *International Journal of Bio-resource and Stress Management* **4**(2): 356-357

Rabari K V., Patel M V, Kadu S P and Umale A A. (2014) Combined effect of organic and inorganic fertilizers on growth, yield attributes, bulb yield and soil nutrient

status after harvest of onion (*Allium cepa* L.). *Trends in Biosciences* **7**(23): 3861-3864

Yogita and Ram R B. (2012) Effect of chemical and biofertilizers on quality of onion. *Hort Flora Research Spectrum* **1**(4): 367-370

Yogita., Ram R B and Babu M. (2012) Effect of inorganic and biofertilizers on growth and yield of onion (*Allium cepa* L.) cv. Pusa Madhavi. *Plant Archives* **12**(2): 645-648