EFFECTS 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.*)". In this experiment 7treatment were applied with three replications and laid out in randomized block design (RBD). Treatments were (T_1) 100% recommended dose of fertilizer (NPK) (Control), (T_2) 80% RDF+ Phosphate SolubilizeingBactira (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.). On the basis of experiment conducted that the treatment T_7i.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, Growth, Vermicompost, PSB,Onion ,Yield

INTRODUCTION

Onion (*Allium cepa* L.) aherbaceous 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 meaning "large pearl". It probably originated from Central Asia (Vavilov 1951). 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 (Sharma *el at*. 2018).

Amongst bio-fertilizers, PSB strains play a key role in harnessing the atmospheric phosphorus through its fixation in the roots (Balemi T 2003). They have ability to solubilize inorganic phosphorus from insoluble compounds.P-solubilization ability of

rhizosphere microorganisms is considered to be one of the most important channels of plant phosphate nutrition.

Vermicompostis a peat-like organic fertilizer with high nutritional contents, aeration, porosity, and water-holding capacity, prepared by the joint action of earthworms and microbes. In addition to organic waste management, Vermicompostis recognized as an effective plant growth promoter [15,16].Vermicompost has large particulate surface area that provides many micro sites for the microbial activity and strong 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 (Maji and Das 2008)). 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.Anon., 2013). Maharashtra is the leading onion growing state of India while, other important states are Gujarat, Karnataka, Bihar, Madhya Pradesh, Andhra Pradesh, Rajasthan, Haryana, Uttar Pradesh and Tamil Nadu.

MATERIALS AND METHOD

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. Treatments were (T1) 100% recommended dose of fertilizer (NPK) (Control), (T2) 80% RDF + Phosphate SolubilizeingBactira (PSB) (5kg/ha.), (T3) 80% RDF + VC, (T4) 80% RDF+VC + PSB (5kg/ha.), (T5) 100 %RDF + PSB (5kg/ha.), (T6) 100% RDF + VC (5kg/ha.) and (T7) 100% RDF + VC + PSB (5kg/ha.).The 7 treatments were replicated three times in randomized block design in 1.50m x 1.50 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 45 day. Vermicompost, Phumdi and the PSB were applied as per treatment on cach unit plot. Five randomly selected equally competitive plants from each row in each replication were tagged for the purpose of recording the observations on 7 characters viz. plant height (cm). number of leaves, number of clumps per plant, total yield per plant (g) and

total weight of root per plant (g). The observations were recorded at 30, 60, 90 and 120 days after sowing. All the required cultural operations along with the irrigation was done as per requirement of the crop. The bulb was harvested at the mature stage.

RESULTS AND DICSUSSION

The pooled data regarding vegetative growth and yield of onion were presented in Table-1 and Table-2 respectively.The data in Table-1 indicated that treatment T_7 (100%RDF+VC+PSB) had the maximum fresh weight of tops (22.78 g) at harvest which was significantly at par with T_6 treatment where as minimum fresh weight of topes (18.43gm) was recorded with T_1 (100% RDF) treatment in this parameter. The data also indicated that T_7 (100%RDF+VC+PSB) treatment had the maximum fresh weight of bulb (80.71 g) 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 Table 1 showed that the treatment T_7 (100%RDF+VC+PSB) produced a significantly maximum diameter of bulb (6.43cm) followed by T_6 which was statistically at par to each other. However,rest of all treatments are 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/ha, 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 Fresh weight of tops (g), Fresh weight of bulb and Diameter of bulb (cm) of Onion as influenced by various treatments

Treatment	Plant height (cm)	No. of green leaves per plant	Fresh weight of tops (g)	Fresh weight of bulb (g)	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**

Table 2- Fresh weight of bulb (kg/plot), Dry matter content of bulb (%) and Total bulb yield (q/ha) of Onion as influenced by various treatments

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 than all other treatments. Application of treatment T_7 [100%RDF+VC+PSB (each 5kg/ha.)] gave maximum Dry matter content of bulb (8.97%) which was significantly higher than all other treatments.

CONCLUSION

On the basis of this investigation, it could be concluded that treatment T_7 i.e., application of [100%RDF+VC+PSB (each 5kg/ha.)] was found superior to all other treatments for growth and yield characters of onion in the study site.

Conference disclaimer:

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