Annals of Plant and Soil Research 20 (Supplement) pp S20 – S23 (2018)

Effect of fertilizer and biofertilizers on vegetative growth, yield and quality of radish (*Raphanus sativus* l.)

GAUTAM SINGH, V.N. MISHRA, B.K. CHATURVEDI, M. SOLANKI AND SUBASH CHANDRA

Department of Horticulture, R.B.S. College, Bichpuri, Agra

ABSTRACT

The field investigation was conducted during rabi season of 2017-2018 at Raja Balwant Singh College, Bichpuri, Agra, U.P. to find out the response of bio-fertilizer viz. VAM and Azotobacter along with NPK on vegetative growth, yield and quality of radish root cv. Japanese White. The experiment was laid out in randomized block design with 8 treatment combinations i.e. T_1 60%RDF+Azotobacter, T_2 60%RDF+VAM, T_3 60% RDF + Azotobacter + VAMT_4(40%RDF + Azotobacter, T_5 40% RDF+ VAM, T_6 40%RDF+Azotobacter +VAM, T_7 RDF 200 :80: 80kg NPK and T_8 control which and replicated thrice. The results envisaged that T_3 (60% RDF + Azotobacter + VAM) treatment was found significantly superior to improve the growth, yield and quality of radish root. The lowest values of growth characters and yield of radish root were recorded under control.

KEY WORDS: VAM, Azotobacter, fertilizers, radish, root yield

INTRODUCTION

The radish (*Raphanus sativus* L.), an edible root vegetable, belongs to Brassicacea or Crucifereae family having chromosome number 2n=18. It is a popular vegetable in India both tropical as well as temperate regions It is cultivated under glass house conditions for early market but large scale cultivated in the field. Radish have many minerals like potassium, iron, phosphorus, magnesium, sodium, zinc and calcium etc and they play an important role in the body's metabolism. Radish is recommended to the patients for a variety of ailments including whooping cough, cancer, coughs, gastric, discomfort liver problems, dyspepsia, gallbladder problems , arthritis, gallstones, kidney stones, piles, enlarged spleen, jaundice and intestinal parasites (Adams; 2008). It is the important ingredients in most of the salads, due to its properties in most of the salads, due to its properties of pro-digestive. It is a low calorie vegetable with various vitamins such as vitamins A,B,C and K. Bio-fertilizer is a substance which contains living micro organisms, when applied to seeds, plant surfaces, or soil, they colonize at the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. It fixies atmospheric nitrogen or solubilize soil phosphorus or stimulate plant growth through synthesis of growth promoting substances. Azospirillum, Azotobacter, Blue green algae, VAM and phosphate solubilizing Bacteria (PSB) can be used as bio-fertilizers to increase the crop production (Singh, *et al.,*1997). Azotobacter is a broad spectrum bio-fertilizer and can be used as inoculants for most horticultural crops. Earlier its utility as a bio-fertilizer was not a priority due to its relatively low population in the plant rhizosphere. Vasicular Arbuscular Mycorrhiza (VAM) is the phosphorus absorber bio-fertilizer. It has co-relation between plant roots and fungi found in internal organs of roots. VAM increase root absorbing surface and are found to reach outside the root depletion zones and help in uptake of nutrients like phosphorus and zinc (Verma, 1992). Keeping these facts in view the present experiment was conducted at R.B.S. College, Agricultural Research farm, Bichpuri, Agra in Rabi season during year 2017-2018 to asses the effect of VAM and azotobacter on the vegetative growth and quality yield of radish root.

METHODS AND METERIALS

The experiment was conducted at research farm of Department of Horticulture, Raja Balwant Singh College, Bichpuri, Agra during 2017-18.The research farm is situated at latitude of $27^0$2 N and longitude of $77^0$9 E at an elevation of 163.4m above sea level . The Agra tract has a tropical and subtropical climate with hot dry summer and severs winter. Under normal climate condition the area receives about 670mm. annual rain fall, around 80% of which occurs from July to September. The mean

annual maximum and minimum atmospheric temperature are 46^0 and $1\text{-}2^0$ respectively. The soil of experimental plot was genetic alluvial with calcareous layer at the depth of about 1.5-2.0 meter. It was sandy loam, fertile, well drained and slightly alkaline in reaction having 7.9 pH. The soil was sufficient in potash content but low in available nitrogen and organic carbon and medium in available phosphorus content. The investigation was laid out under randomized block design having 8 treatment combinations: T_1 (60%RDF+Azotobacter) T_2 (60%RDF+VAM) T_3 (60% RDF + Azotobacter +VAM) T_4 (40%RDF + Azotobacter) T_5 (40% RDF+ VAM) T_6 (40% RDF + Azotobacter +VAM) T_7 (RDF 200:80:80 kg NPK) and T_8 (control) which were replicated thrice. The seeds of radish cv. Japanese white were sown on the top of ridge on 1.12.2017. The spacing from ridge to ridge was kept 40 cm. and seed to seed 10 cm. Two seeds were sown at each hill at a depth of about 2 cm. depth only bold and apparently healthy seeds were used. Finally maintain the proper plant population by removing the week and unhealthy plant and maintained gapped place. The growth and yield of radish roots were recorded at harvest.

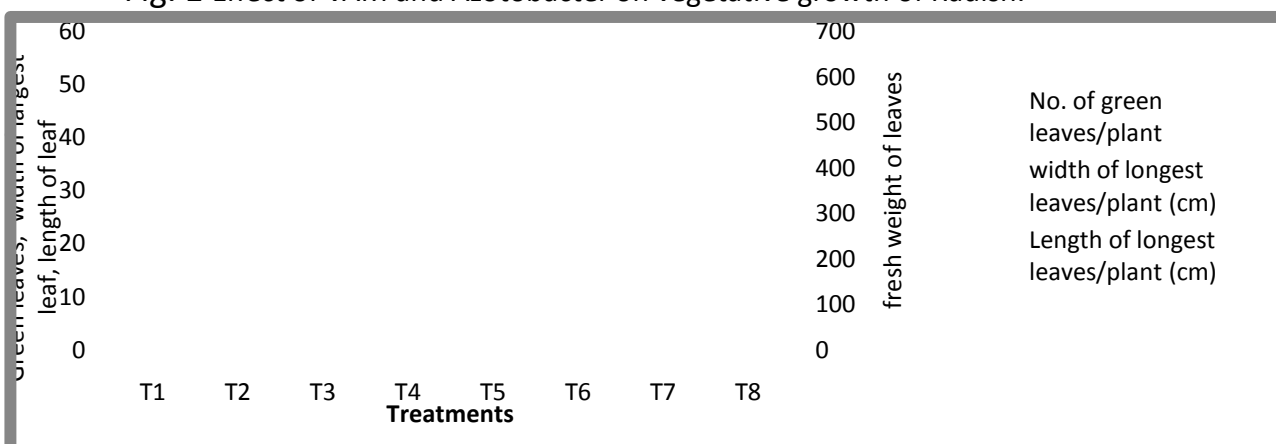
RESULTS AND DISCUSSION

It is evident from Table 1 that different treatment combinations showed significant effect on different vegetative observations except fresh weight of leaves per plant in radish .The significantly maximum number of green leaves (12.00) was counted with T_3(60% RDF + Azotobacter + VAM) followed by T_7, T_6 and T_5 which were found at par to each other. The maximum length and width of longest leaves (55.90 cm.) and (13.65 cm.) were measured with T_3 (60% RDF + Azotobacter + VAM) treatment followed by T_1 (60% RDF + Azotobacter). Significantly minimum number of leaves (8.70), length of longest leaf (31.53 cm), width of longest leaf (9.15 cm) and fresh weight of leaves per plant (206.80 g) were recorded with T_8 (control). These findings are in the close proximity to the results reported by Sharma *et al.* (2013), Manker *et al.* (2015) and Shani Kumar *et al.* (2017).

Table No. 1: Effect of VAM and Azotobacter on vegetative growth of radish

Treatment	No. of green leaves per plant	Length of largest leaves per plant (cm)	Width of largest leaves per plant (cm)	Fresh weight of leaves per plant (gm)
T_1	11.10	55.13	13.15	595.17
T_2	11.18	53.36	13.15	561.9
T_3	12.00	55.90	13.65	595.17
T_4	10.30	53.43	11.05	491.8
T_5	11.30	51.80	12.13	391.1
T_6	11.50	50.03	11.85	536.4
T_7	11.80	53.90	13.05	460.3
T_8	8.70	31.53	9.15	206.8
CD (P=0.05)	1.21	4.01	1.09	NS

Fig. 1 Effect of VAM and Azotobacter on vegetative growth of Radish.

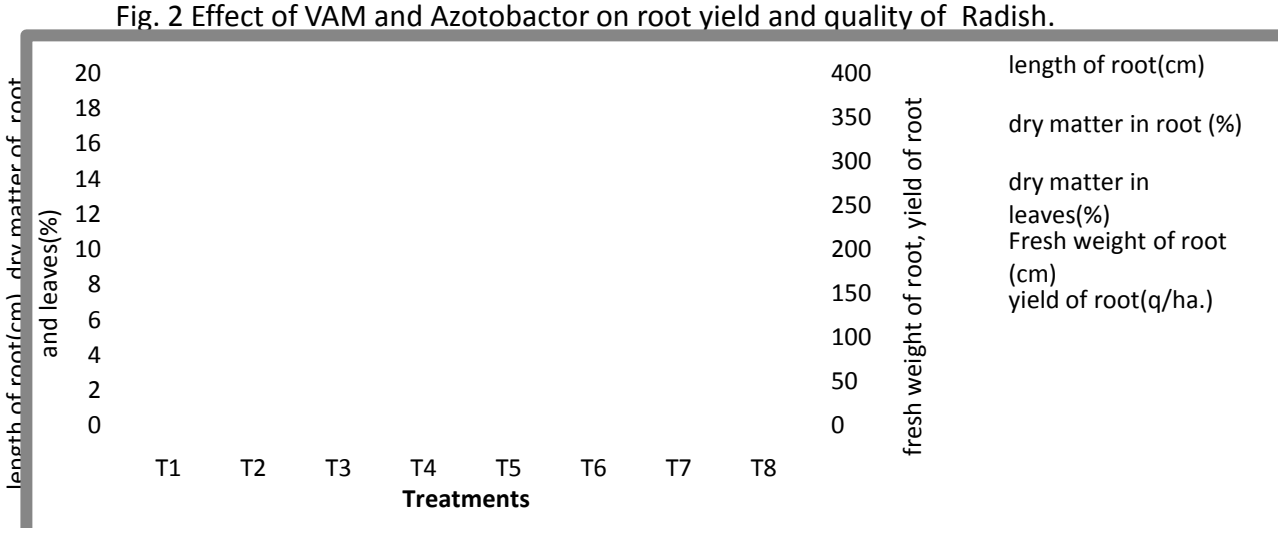


The data (Table 2) revealed that all the treatments have significant effect on fresh weight of root, yield of root, dry matter in root and dry matter content in leaves as compared to control. The non significant response was found in the length of radish root where maximum length of root (17.89cm) was measured in T_3 (60%RDF + Azotobacter + VAM) and minimum (13.35 cm) in control (T_8).

Table No. 2: Effect of VAM and Azotobacter on root yield and quality of Radish

Treatment	Fresh weight of root (gm)	Length of root (cm)	Yield of roots (q/ha)	Dry matter content in root (%)	Dry matter content in leaves (%)
T_1	268.90	17.05	253.72	8.32	6.63
T_2	275.47	14.85	242.77	8.12	4.37
T_3	358.25	17.57	287.00	8.59	7.57
T_4	223.80	14.51	278.43	6.66	5.77
T_5	223.80	16.05	264.64	7.39	5.50
T_6	242.62	13.98	278.68	6.31	6.18
T_7	308.88	17.89	218.00	8.24	6.79
T_8	164.35	13.35	193.60	6.09	4.33
CD (P=0.05)	183.38	NS	31.86	1.23	1.18

Fig. 2 Effect of VAM and Azotobactor on root yield and quality of Radish.



The maximum (287.00 q ha^{-1}) root yield was observed from T_3 (60%RDF + Azotobacter + VAM) followed by T_6,T_4 and T_5 which were found at par to each other. The maximum fresh weight of root per plant (358.25 g), dry matter content of root (8.59%) and leaves (7.57%) were recorded with T_3 treatment (60%RDF + Azotobacter + VAM) followed by T_7(RDF-200:80:80 NPK). The significantly minimum fresh weight of root (164.35 g), length of root (13.35 cm), yield of roots (193.60 q ha^{-1}), dry matter content in root (6.09%) and leaves (4.33%) were observed in T_8 (Control).It may be due to balanced application of NPK and bio-fertilizer which makes the availability of almost all the major nutrients in available form and improve the physio-chemical properties of soil. The findings are in consonance with the earlier results of Shruthi *et. al* (2016) and Kumar *et. al* (2017).

REFERENCES

Adams, M.(2008) Radish. Healing Food Reference Retrieved July **21**, 2008.

Kumar, D, Kumar, S, Meena, R. K. and Verma, S. (2017**)** Effect of organic and inorganic Fertilizer on growth, yield and quality of cabbage (*Brassica oleracea* L. var. capitata), *Int. J. Pure App. Biosci.* **5**(5): 1590-1593.

Mankar, A; Kumari, C. and Khurana K. (2015) Effect of nitrogen levels and microbial inoculants on growth, yield and quality of cabbage. *Progressive Horticulture* **47**(2): 296-299.

Shani Kumar; Sanjay Kumar; Sutana Maji and Pandey V.K, (2017). Effect of inorganic fertilizers and bio-fertilizers on growth, yield and quality of radish (*Raphanus sativus* L.), *Environment and Ecology* **35**(1) : 25-28

Sharma, Dulichand; Singh, R.K. and Parmar, A.S. (2013) Effect of Doses of Bio-fertilizers on the growth and production of cabbage (*Brassica Oleracea* L. var. capitata), TECHNOFAME- *A Journal of Multidisciplinary Advance Research* **2** (1): 30-33

Shruthi, H.T., Srinivasa, V., Ibaad, M.H. and Prajna S.P. (2016) Effect of bio-fertilizers on growth and root yield of radish (*Raphanus sativus* L.) cv. Pusa Chetki under hill zone of Karnataka. India, *Environment and Ecology* **34** (4A): 2014-2017.

Singh, T.B., Malik, S.K., and Pal, S. (1997) Possibilities of increasing wheat production in India, Indian Farmers Digest. 30:11

Verma, L.N. (1992**)** Research and development on bio-fertilizer, National Seminar on organic farming, org. by JNKVV, Jabalpur & IGKVV Raipur, pp 74-82.