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SHORT COMMUNICATION

Effect of organic manures and bio-fertilisers on growth and quality of *kharif* onion (*Allium cepa* L.) in semi-arid region

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Onion (*Allium cepa* L.) is a bulbous biennial herb of family Alliaceae. It is commonly called as "Queen of kitchen" for its unique usage throughout the year in the form of salads, condiments or for cooking with other vegetables. The pungency in onion is due to sulphur compound "ally propyl disulphide" in the volatile oil and the outer yellow skin colour is due to the presence of "querctin" (Nadkarni, 1954). Onion bulb is rich in minerals like phosphorus (50mg/100g), iron (0.7mg/100g), calcium (18mg/100g), carbohydrates (11.0g/100g), protein (1.2g/100g), vitamins 'C' (11mg/100g), fibers (0.6g/100g) and nicotinic acid (0.4mg/100g) (Aykroyd,1963). The productivity of onion in India is very low (16 t ha^{-1}) in comparison to other countries. Thus there is ample scope for increasing production through fertilizers, especially that of organic manures and bio-fertilsers in light textured soil. Production of onion in *kharif* season is more important to have continuous supply of onion round the year. Organic manures stimulates the production of polysaccharides and other compounds that favours aggregation of fine soil particles, there by promoting good structure, improved tilth, aeration, moisture movement and retention (Bose *et al*., 2001). Bio-fertiliser inoculation like *Azosprillium,* PSB helps the plants to attain better vegetative growth and increases yield by 10-30 percent (Mohondas, 1999 and Tilak and Annapurna, 1993). The present investigation was taken up to study effect of organic manures and bio-fertilisers on *kharif* onion in semi arid region.

The experiment was conducted during 2011-12 at Horticulture farm, S.K.N. College of Agriculture, Jobner (Jaipur). The soil of experimental field was alkaline loamy sand in texture at *p*H 8.1, poor in organic carbon (0.135 %), available N (134.70 kg/ha), P (16.85 kg/ha), K (151.65 kg/ha) and Zn (0.42 mg/kg soil). The experiment was laid out in randomized block design (RBD) with eighteen treatment combinations including six levels of organic manures (Control, FYM @ 10 t ha^{-1}, vermicompost @ 5 t ha^{-1}, poultry manure @ 5 t ha^{-1}, FYM @ 5 t ha^{-1} + vermicompost @ 2.5 t ha^{-1}, FYM @ 5 t ha^{-1} + poultry manure @ 2.5 t ha^{-1}) and three bio-fertilizer treatments (without inoculation, *Azospirillium*, *Azospirillium* + PSB) with 3 replications. Randomization of the treatments was done with the help of random number table as advocated by Fisher (1950). The plot size was 2.1m X 2.4 m with 35 cm × 15 cm spacing between rows and plants. Organic manures were spread in the beds uniformly before transplanting of seedling. *Azosprillium* and PSB were applied as 100g per acre culture dissolved of water and dipping the bulb of the onion in solution for 10-20 minutes before sowing and dried in shade (Paul *et al.,* 1971). Growth attributes were calculated using standard methods and chlorophyll content was estimated by method advocated by Arnon (1949). Sulphur was estimated by Turbidimetric method (Tabatabi and Bremner, 1970), while phosphorus by digesting plant sample with Tri-acid mixture of HNO_3: H_2SO_4: $HClO_4$ and was estimated by "Vandomolybdo" phosphate yellow colour method (Jackson, 1973). Estimation of nitrogen was done from digested samples by colorimetric method after development of colour with Nesseler's reagent (Snell and Snell, 1939) and Total soluble solids (TSS) per cent were determined using zeiss hand refractometer. The 'F-test' and critical difference (CD) calculated to test significance of difference among the treatments, wherever the results were significant.

Effect of organic manures

(i) Growth attribute: The increasing levels of organic manures significantly increased the plant height, number of leaves per plant, fresh weight of leaves and total chlorophyll content in leaves (Table 1). The application of FYM @ 5 t ha^{-1} + vermicompost @ 2.5 t ha^{-1} gave significantly highest increase in the growth attributes. Improvement in plant growth attributed might be due to the fact that organic

manures such i.e., FYM, vermicompost and poultry manure might have enhanced the soil microbial activity , which might have interned in to higher improved the physical condition of soil in respect of granulation, friability and porosity and ultimately provided a balanced nutritional environment to the soil plant nutrition system. (Kumar *et al*., 2003 and Thanuhathan *et al.,* 1997).

(ii) Quality parameters: A significant increase in nitrogen content and TSS content of onion bulb was observed by the application of FYM @ 5 t ha^{-1} + vermicompost @ 2.5t ha^{-1} (Table 1), over control. Other quality parameter *viz.,* phosphorus content and sulphur content of onion bulb significantly increased under FYM @ 5 t ha^{-1} + poultry manure @ 2.5t ha^{-1} (Table 1). This might be due to enhanced translocation of nutrient, vitamins and proteins in to the bulb, due to improved nutritional environment in the rhizosphere as well as its utilization in the plant system. This in turn helped in increased physiological functions of plants. The increased activity of nitrate reductase, which helped in synthesis of certain amino acids and protein can also be other reason (Ramesh *et al*., 2006, Choudhary *et al*., 2003 and Sharma *et al*., 2009).

Effect of bio-fertilisers

(i) Growth parameters: The significant increase in plant height, number of leaves, fresh weight of bulb and total chlorophyll content of leaves were observed due to increased inoculation of *Azosprillium* + PSB. This might be due to increase in available nitrogen and phosphorus in rhizosphere due to atmosphere nitrogen fixing by *Azosprillium* and by activity of phosphate solubilizers (Mengistu and Singh, 1999 and Barakart and Gabr, 1998). The combined inoculation of nitrogen fixer and PSB benefits the plant more than either group of organisms alone and might have added advantages in the degraded agro-ecosystem (Bareth, 1998 and Muthuramalingam *et al*., 2001).

(ii) Quality parameters: The bulb inoculation with *Azosprillium* and *Azosprillium* + PSB significantly increased the nitrogen, phosphorus, sulphur and TSS content of onion bulb. *Azosprillium* might have fixed higher amount of nitrogen in soil and made available to the plants resulted in better uptake of N by plant. Phosphobacteria would have caused more mobilization and solubilization of insoluble P in the soil and improved the availability of phosphorus which would have caused an increase uptake of phosphorus of plants. The quality attributes improved due to higher photosynthetic rate with better source sink relationship and nutrient uptake besides excellent physiological and biochemical activities. The results are in confirmation with finding of Tanwar *et al*. (2003) and Yeptho *et al*. (2012).

Table 1. Influence of organic manures and bio-fertilisers on growth and quality attributes of *kharif* onion (*Allium cepa* L.)

Treatments	Plant height (cm)		No. of leaves $plant^{-1}$	Fresh wt of leaves $plant^{-1}$	Total chlorophyll content of leaves(mg^{-1})	TSS content of bulb (%)	Nitrogen content of bulb (%)	Phosphorus content of bulb (%)	Sulphur content of bulb (%)
	60 DAT	Harvest							
Organic manures									
Control	28.03	48.11	9.96	52.56	0.063	9.89	0.71	0.25	0.60
FYM 10 t ha^{-1}	32.92	51.89	10.94	56.11	0.068	10.98	0.74	0.28	0.63
Vermicompost 5 t ha^{-1}	34.92	55.11	11.69	57.78	0.069	11.69	0.75	0.28	0.64
Poultry manure 5 t ha^{-1}	38.24	58.22	12.43	59.83	0.071	12.34	0.77	0.32	0.67
FYM 5 t ha^{-1} +V.C. 2.5 t ha^{-1}	43.66	63.57	13.61	63.11	0.076	13.57	0.80	0.34	0.68
FYM 5 t ha^{-1} + P.M. 2.5 t ha^{-1}	41.98	61.82	13.33	61.17	0.075	13.33	0.80	0.35	0.70
SEm±	1.17	1.18	0.27	0.74	0.002	0.26	0.01	0.01	0.01
CD (p=0.05)	3.38	3.39	0.76	2.13	0.004	0.75	0.03	0.02	0.02
Bio-fertilsers									
Control	30.70	50.54	10.29	54.91	0.065	10.26	0.72	0.27	0.62
Azosprillium	36.82	56.92	12.27	59.12	0.073	12.22	0.76	0.30	0.65
Azosprillium + PSB	41.86	61.90	13.42	61.25	0.074	13.42	0.80	0.34	0.68
SEm±	0.83	0.84	0.19	0.52	0.001	0.18	0.01	0.00	0.00
CD (p=0.05)	2.39	2.40	0.54	1.51	0.003	0.53	0.02	0.01	0.01

V.C. = Vermi-compost, P.M. = Poultry Manure

References

Arnon, D.I. 1949. Copper enzyme in isolated chloroplast. Polyphenol oxidase in *Beta vulgaris. Plant Physiology*, 24: 1-5.

Aykrody, W.R. 1963. ICMR. Special Report, Series, No. 42.

Barakart, M.A.S. and Gabr, S.M. 1998. Effect of different biofertilizer and nitrogen fertilizer levels on tomato plant. *Alexandria Journal.Agril. Reseach*., 43: 149-160.

Bareth, V. 1998. Effect of phosphorus, molybdenum and PSB on growth and yield of cowpea. *M.Sc. Thesis*, Submitted to Rajasthan Agricultural University, Bikaner, Campus-Jobner.

Bose, T.K., Kabir, J., Das, P. and Joy, R.P. 2001. *Organic farming in horticulture crops. Tropical Horticulture*, 2:20, Publishing Naya Prakash,New Delhi, p.150

Choudhary, R.S., Anchal, Das, Patnaik, V.S. and Das, A. 2003. Organic farming for vegetable production using vermicompost and FYM in Kokriguda watershed of Orissa. *Indian Journal of Soil Science Conservation*, 31: 203-206.

Fisher, R.A. 1950. *Statistical method for research workers*, Oliver and Boyd, Edinburg, London.

Jackson, M.L. 1973. *Soil chemical analysis*. Prentice Hall of India Pvt.Ltd., New Delhi, pp.498.

Kumar, S., Singh, R.C. and Kadian, V.S. 2003. Performance of mungbean as influenced by seed inoculation. *Indian Journal of Pulses Research*, 16: 67-68.

Mengistu, F. and Singh, N. 1999. *Vegetable Science*, 26:193-195.

Mohandas, S.1999. Biofertilizer for Horticulture crops. *Indian Horticulture*. 43: 32-37.

Muthuramalingam, S., Natarajan, S., Sendurkumaran, S. and Muthuvel, I. 2001. Morphological characters as influenced by spacing and nutrients in seed propagated aggregatum onion (*Allium cepa* L. var aggregatum Don.) type Gnanamedu local. *Madras Agricultural Journal,* 88: 379-382.

Nadkarni, K.N.1954. *Allium cepa* Linn and *Allium sativum* Linn. *Indian Materia Medica*, Popular book depot, Bombay : 963.

Paul, N.B., Rewari, R.B., Sen, A., Sundeao, W.V.B. and Bhatnagar, R.S.1971. Rhizobial inoculation o pulse crops for better yield .Division of microbiology, New vistas in pulse production, IARI, New Delhi, pp-47-56.

Ramesh, P.S., Singh, M., Panwar, N.R., Singh, A.B. and Ramana, S. 2006. Response of pigeonpea varieties to organic manures and their influence of fertility and enzyme activity of soil. *Indian Journal of Agricultural Science*, 76: 252-254.

Sharma, R.P., Dutt, N. and Chander, G. 2009. Effect of vermicompost, farm yard manure and chemical fertilizers on yield, nutrient uptake and soil fertility in okra (*Abelmoschus esculentus*), onion (*Allium cepa*) sequence in wet temperature zone of Himachal Pradesh. *Journal of the Indian Society of Soil Science*, 57: 3.

Snell, P.D. and Snell, G.T. 1949. *Calorimetric methods of analysis*, 3rd End. Vol. II D. Van. Nostrand CO. Inc., New York.

Tabatabi, M.A. and Bremner, J.M. 1970. A simple turbidimetric method of determining total sulphur in plant material. *Agron. Jouranal*, 62: 805-806.

Tanwar, S.P.S., Sharma, G.L. and Chahar, M.S. 2003. Effect of phosphorus and biofertilizer on yield , nutrient concentration and uptake by blackgram [*Vigna munga* (L.) Hepper]. *Legume Research*, 26: 39-41.

Thanunathan, K., Natarajan, S., Kumar, R.S. and Arul-Murugan, K. 1997. Effect of different sources of organic amendments on growth and yield of onion in mine soil. *Madras Agriculture Journal,* 84: 382-384.

Tilak KVBR and Annapurna K. 1993. Bacterial fertilizers. *Proceeding Indian National Academic Science,* **59** (3-4): 315-324.

Yeptho, K.A., Vitoli, A.K., Singh, S.P., Kanaujia, V.B. and Singh, B. 2012. Quality production of *kharif* onion (*Allium cepa*) in response to bio-fertilsers inoculated organic manures. *Indian Journal of Agricultural Sciences*, 52: 2012.