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

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Abstract

A field experiment was conducted at Horticulture farm, S.K.N. College of Agriculture, Jobner (Rajasthan) during *kharif*, 2012 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). Results indicated that yield attributes, netreturns and B: C in bulb increased significantly with the combined application of FYM @ 5 t ha^{-1} + vermicompost @ 2.5 t ha^{-1}. While phosphorus and sulphur content of bulb significantly increased with application of FYM @ 5 t ha^{-1} + poultry manure @ 2.5 t ha^{-1}. Bulb inoculation with *Azospirillium* + PSB significantly increased both growth and quality attributes over other treatments.

Key words: Kharif onion, Bio-fertilizers, Sulphur, *Azospirillum*, PSB, vermicompost

Introduction

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 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, thereby 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.

Materials and Methods

The experiment was conducted during 2011-12 at Horticulture farm, S.K.N. College of Agriculture, Jobner (Jaipur) during *rabi* season. 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

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solution for 10-20 minutes before sowing and dried in shade (Paul *et al.,* 1971). Yield attributes were calculated using standard methods. For calculating economics, the average treatment yield along with prevailing market rates of the produce and cost of inputs were used. The 'F-test' and critical difference (CD) calculated to test significance of difference among the treatments, wherever the results were significant.

Results and Discussions

Effect of organic manures on yield and yield attributes:

The combined application of FYM @ 5 t ha^{-1} + poultry manure @ 2.5 t ha^{-1} registered significantly superior increase in yield attributes over other doses and control. The increased yield and yield attributes with combined application might be due to rapid availability and utilization of nutrients, by creation of favourable soil environment, for various metabolic plant processes for carbohydrate production, which undergo hydrolysis and get distributed to reproductive parts which ultimately helped in increasing yield and may also be due to the increased rate of release of macro and micronutrients during the course of microbial decomposition (Choudhary *et al*., 2003 Narayanamma *et al.,* 2004 and Blay *et al*, .2002).

Effect of bio-fertilisers on yield and yield attributes

Combined inoculation with *Azosprillium* + PSB significantly increased the neck thickness, diameter of bulb, fresh weight of bulb and bulb yield over other treatments (Table 1). The increased availability of nitrogen due to *Azosprillium* coupled with phosphorus due to PSB might have increased the yield attributes and ultimately the yield. These findings corroborate the results of Mehtha *et al*., 1995; Subbian, 1994 and Pareek *et al.,* 1996.

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

Treatments	Neck thickness of bulb (cm)	Diameter of bulb (cm)	Fresh weight of bulb (g)	Total bulb yield (q ha^{-1})	Net returns	B : C ratio
Organic manures						
Control	0.95	3.68	79.78	136.30	111210	2.12
FYM 10 t ha^{-1}	1.07	4.20	88.44	155.83	132650	2.44
Vermicompost 5 t ha^{-1}	1.08	4.55	92.50	160.61	130383	2.09
Poultry manure 5 t ha^{-1}	1.18	5.06	101.33	179.61	159683	2.86
FYM 5 t ha^{-1} +V.C. 2.5 t ha^{-1}	1.20	5.37	103.56	187.61	166783	2.86
FYM 5 t ha^{-1} + P.M. 2.5 t ha^{-1}	1.28	5.54	109.68	199.50	184300	3.34
SEm±	0.03	0.15	2.74	6.30	7555	0.14
CD (p=0.05)	0.010	0.43	7.87	18.10	21714	0.40
Bio-fertilsers						
Control	1.02	4.12	89.64	155.22	129975	2.31
Azosprillium	1.14	4.68	95.34	169.70	147228	2.62
Azosprillium + PSB	1.22	5.40	102.67	184.81	165302	2.93
SEm±	0.02	0.11	1.94	4.45	5342	0.10
CD (p=0.05)	0.07	0.31	5.57	12.80	15354	0.28

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

Effect of organic manures and bio-fertilisers on economics

The highest B: C ratio (3.34:1) was obtained with application of FYM @ 5 t ha^{-1} + poultry manure @ 2.5 t ha^{-1}, and *Azosprillium* + PSB (2.93: 1). This might be due to the low cost involvement in nutritional supply to the crop plants and higher bulb yield of onion obtained under this treatment. Similar results have been reported by Yetho *et al*., (2012) and Patel *et al*., (2011)

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