

SHORT COMMUNICATION

Response of Onion (*Allium cepa* L.) to Different Levels of NPK and FYM Under Arid Condition of Rajasthan

Priyanka Bairagi, S. R. Yadav, I. J. Gulati and I. M. Verma
Department of Soil Science and Agricultural Chemistry,
College of Agriculture, Bikaner
(Received: 29.09.2014; Accepted : 2.12.2014)

Onion (*Allium cepa* L.) is one of the commonest and indispensable vegetable cum condiment crop grown for local consumption, export and processing. Among the different methods of irrigation, drip irrigation is the most important one which was developed originally as a sub irrigation system. India is the second largest producer of onion after China grown in about 10.03 lakh hectare area with the production of 145.61 lakh tonne of bulbs in the country and productivity is about 13.99 tonne per hectare (Anonymous, 2011). In Rajasthan total area of onion is about 73456 hectare with 664215 tonnes production and 9042 kg per hectare productivity (Anonymous 2011), (Thimmaiah (1989);, Singh *et al.* (2003);, Krishnamurthy and Sharanappa (2005) ;, Mandloi *et al.* (2008) ;, Hari *et al.* (2009)). In Rajasthan, the area under drip irrigation is 30300 ha (Alam and Kumar, 2007). Fertilizer-use efficiency (FUE) was worked out as a factor of total economic yield from all harvests by quantity of fertilizer applied and expressed as kg yield/kg NPK. (FUE) was worked out as a factor of total economic yield from all harvests by quantity of fertilizer applied and expressed as kg yield/kg NPK. Therefore, present investigation will be helpful in evaluating the efficiency of applied nitrogen, phosphorus and potassium with FYM on the growth and yield of onion under drip irrigation with saline water.

A field experiment was conducted during *Rabi* 2012-13. The region is characterized by deep, coarse sandy soil. Experiment consisted of 16 treatment combinations comprising of four NPK levels (0,75,100 and 125 % RDF kg ha⁻¹) with four FYM levels (0,10,20 and 30 t ha⁻¹). It was conducted in split plot design with four replications. To raised nursery beds onion variety Nasik Red (N-53) of 3 m x 1 m x 0.15 m in size were prepared. Water soluble urea, muriate of potash and mono potassium phosphate were applied as per treatments after transplanting through drip irrigation. FYM was applied 20 days before transplanting as per the treatment combinations in their respective plots, mixed and irrigated.

$$\text{EUF} = \frac{\text{Yield (kg/ha)}}{\text{Total quantity of nutrient applied (kg/ha)}}$$

$$\text{Gross returns (Rs. ha}^{-1}\text{)} = \text{Returns from fruit of onion (Rs. ha}^{-1}\text{)}$$

$$\text{Net returns (Rs. ha}^{-1}\text{)} = \frac{\text{Gross returns (Rs. ha}^{-1}\text{)} - \text{Total cost of cultivation (Rs. ha}^{-1}\text{)}}{\text{Gross returns}}$$

$$\text{B:C ratio} = \frac{\text{Gross returns}}{\text{Cost of cultivation}}$$

Doses of fertilizer application have shown significant impact on fertilizer use efficiency of onion in the table. It was recorded with the application from 100% recommended dose of NPK fertilizer (12.18 kg kg⁻¹ of fertilizer) to 75% recommended dose of NPK fertilizer (12.18 kg kg⁻¹ of fertilizer) but at 125% recommended dose of NPK fertilizer, significant decrease the fertilizer use efficiency as compared to 100% recommended dose of NPK fertilizer through drip irrigation. The present findings are in good accordance with the results of Veeranna *et al.* (2001), Singhandhupe *et al.* (2003), Hongal and Nooli (2007), Arunadevi (2005), and Badr and Abou Ei-Yaized (2007) and Vijaykumar *et al.* (2010). Fertilizer use efficiency of onion increased significantly with the application of 10, 20 and 30 t FYM ha⁻¹, and the maximum fertilizer use efficiency of 9.92 kg kg⁻¹ of fertilizer was recorded with FYM 3 t ha⁻¹ in the table. This might be due to greater multiplication of soil microbes which could have converted organically bound nutrients to inorganic form (Bellakki and Badanur, 1997). Organic manures being a source of nutrients favor and encourage soil microbial activity, enhances phosphorus activity, slow down release on nitrogen, reduces leaching losses, particularly of nitrogen and potassium and ultimately improved fertilizer use efficiency. The similar results have also been reported by Prakash *et al.* (2002) Bhattacharya *et al.* (2004) and Chaturvedi and Chandel (2005) in Soybean and Kumawat and Jat (2005) in barley, Ray *et al.* (2005) in okra and Mali *et al.* (2006) in cucumber, Ullah *et al.* (2008) in brinjal, Kumar and Sharma (2004) in tomato, Ansari (2008) in potato, Mgbeze and Abu (2010) in African Yam.

Doses of fertilizer application have shown

significant impact on B:C ratio and net returns in the table. A significantly higher B:C ratio and net return was recorded with the 100% recommended dose as compared to control and 75% recommended dose of NPK fertilizer through drip irrigation. This might be due to the fact that under the treatments the cost of input added was low as compared to increase and value of output obtained; therefore, higher bulb yields resulted in higher net returns. These findings are similar to those of Thimmaiah (1989), Mandloi *et al.* (2008) and Shinde *et al.* (2013) in onion, Singh *et al.* (2003) in potato, Madhuri *et al.* (2006) in turmeric. B:C ratio and net returns increased significantly with the application of

10, 20 and 30 t FYM ha⁻¹, and the maximum and significant net returns (Rs 97745.50 per hectare) and B:C ratio (2.32) were recorded with FYM 30 t ha⁻¹ in the table. This might be due to the fact that under these treatments the cost of input added was low as compared to output obtained, therefore, higher bulb yields resulted in higher net returns. These findings are similar to those of Choudhary and Chandra (2006a) who reported maximum net return of Rs. 52,882 and B:C ratio 4.89 by the application of vermicompost @ 9 t ha⁻¹ as compared to net return of Rs. 50,469 and B:C ratio of 4.66 by the application of 60 : 30 : 30 kg NPK ha⁻¹. The

Table 1. Effect of NPK-drip fertigation and FYM levels on FUE, net returns and B:C ratio

Treatments	FUE (kg/kg of nutrient)	Net returns (Rs. ha ⁻¹)	B:C ratio
Fertilizer levels (NPK kg ha ⁻¹)			
(i) Control	-	54562	1.96
(ii) 75 % RDF (75:37.5:75)	10.80	81770	2.17
(iii) 100% RDF (100:50:100)	12.18	97746	2.32
(iv) 125% RDF (125:62.5:125)	10.87	100388	2.28
S.Em.±	0.41	2787	0.04
C.D. (5%)	1.30	8915	0.14
FYM levels (tonne ha ⁻¹)			
(i) Control	6.79	52100	1.83
(ii) 10	8.41	77345	2.15
(iii) 20	8.72	95705	2.33
(iv) 30	9.92	109316	2.42
S.Em.±	0.40	1862	0.03
C.D. (5%)	1.17	5339	0.07

above finding are also in conformity with the findings of Mandloi *et al.* (2008) and Chatoor *et al.* (2010) in onion, Yadav and Luthra, (2005) in vegetable pea, Kalalbandi *et al.* (2007) in cabbage and Sharma and Bhalla (1995) and Bairwa *et al.* (2009) in Okra.

References

- Arunadevi, K. 2005. Performance evaluation of drip irrigation and fertigation on the yield and water use efficiency of mulberry. Ph. D. Thesis, Tamil Nadu Agricultural University, Coimbatore.
- Alam, A. and Kumar, A. 2007. Micro irrigation system past, present and future. Eds. Singh, H.P., Kaushish, S.P., Kumar, A., Murthy, T.S. and Samuel, irrigation J.C. in micro irrigation, CBIP, 17.
- Ansari, Abdullah Adil 2008. Effect of vermicompost on the productivity of potato (*Solanum tuberosum*), spinach (*Spinacia oleracea*) and turnip (*Brassica campestris*). *World Journal of Agricultural Sciences*, 4 (3): 333-336.
- Bellakki, M.A. and Badanur, V.P. 1997. Long term effect of integrated nutrient management on properties of vertisols under dry land Agriculture. *Journal of the Indian Society of Soil Science*, 45: 438-442.
- Bhattacharya, R. Prakash, V., Kundu, S., Srivastava, A.K. and Gupta, H.S. 2004. Effect of long-terms manuring on soil organic carbon, bulk density and water retention characteristics under soybean-wheat cropping sequence in North-Western Himalayas. *Journal of the Indian Society of Soil Science*, 52: 238-242.
- Chaturvedi, S. and Chandel, A. S. 2005. Influence of organic and inorganic fertilization on soil fertility and productivity of soyabean. *Indian Journal of Agronomy*, 50 : 311 313.
- Badr, M.A. and Abou El-Yazied, A.A. 2007. Effect of fertigation frequency from subsurface drip

- irrigation on tomato yield grown on sandy soil. *Australian Journal of Basic and Applied Sciences*, 1(3): 279-285.
- Bairwa, H.L., Shukla, A. K. Mahavar, L.N., Kaushik, R.A. Shukla, K.B and Ameta, K.D. 2009. Response of integrated nutrient management on yield, quality and physiological characteristics of okra cv. Arka Anamika. *Indian Journal of Horticulture*, 66 (3): 310-314.
- Choudhary, M.K. and Chandra, Atul. 2006. Effect of integrated nutrient management on yield and yield attributing characters in okra and its residual effect on succeeding crop radish. *Indian Journal of Arid Horticulture*, 1(1): 25-27.
- Chattoo, M. A., Najar, G. R., Mir, S. A. and Faheema, S. 2010. Effect of organic manures and inorganic fertilizer on growth, yield nutrient uptake and economics of onion cv. Yellow Globe. *Journal of eco-friendly Agriculture*, 5(1): 12-14.
- Hongal, M.M. and Nooli, S.S. 2007. Nutrient movement in fertigation through drip-a review. *Journal of Agricultural Review*, 28 (4), 301-304.
- Hari, G. S., Kumar A. K., and Reddy, A. V. 2009. Effect of organic manures in combination with 'N' fertilizers on growth and yield of onion (*Allium cepa* L.) under irrigated conditions of Central Telangana Zone of Andhra Pradesh. *Research on Crops*, 10(1): 103-104.
- Kumar, Pradeep and Sharma, S.K. 2004. Integrated nutrient management for sustainable cabbage tomato cropping sequence under mid hill conditions of Himachal Pradesh. *Indian Journal of Horticulture*, 61(4): 331-334.
- Kalabandi, B. M., Dabhade, R.S. and More, S.S. 2007. Effect of organic and inorganic fertilizers on growth, yield and quality of cabbage (*Brassica oleracea* var. capitata). *Asian Journal of Horticulture*, 2(2): 144-147.
- Mali, M.D., Musmade, A.M., Kulkarni, S.S., Prabhu, T. and Birade, R.M. 2006. Effect of organic manures on yield and nutrient uptake of cucumber (*Cucumis stivus* L.) cv. Himangi. *South Indian Horticulture*, 53(1-5): 100-115.
- Madhuri, S., Poinkar, Shembekar, R.Z., Neha Chopde, Nisha, B., Archana, K. and Kishor, D. 2006. Effect of organic manure and biofertilizer on growth and yield of turmeric (*Curcuma longa* L.). *Journal of Soil and Crops*, 16(2): 417-420.
- Mgbeze, G.C. and Abu, Y. 2010. Effects of NPK and farm yard manure on the growth and development of the African yam bean (*Sphenostylis stenocarpa* Hochst ex a rich). *African Journal of Biotechnology*, 9 (37): 6085-6090.
- Prakash, Y.S. Bhadoria, P.B.S. and Rakhit, A. 2002. Comparative efficacy of organic manures on the changes in soil properties and nutrient availability in an Alfisol. *Journal of the Indian Society of Soil Science*, 50: 219-221.
- Ray, R., Patra, S.K., Ghos, K.K. and Sahoo, S.K. 2005. Integrated nutrient management in okra (*Abelmoschus esculentus* L. Moench) in a river basin. *Indian Journal of Horticulture*, 62(3): 260-264.
- Singh, K. and Singh, R.P. 1965. Effect of various sources and levels of nitrogen on growth of and fruiting response of bhindi. *Horticulturist*, 1: 76-80.
- Singh, N., Sharma, R. C. and Singh, B. P. 2003. Effect of NPK fertigation and planting patterns on yield and economics of potato under drip irrigation. *Journal of the Indian Potato Association*, 30(1/2): 69-70.
- Singh and hupe, R.B., Rao, G.G.S.N. Patil, N.G. and Brahmanand, P.S. 2003. Fertigation studies and irrigation scheduling in drip irrigation system in tomato crop. *European Journal of Agronomy*, 19: 372-40.
- Shinde, K. G., Bhalekar, M. N. and Patil, B. T. 2013. Response of foliar feeding of water soluble fertilizers in onion. *Journal of Agriculture Research and Technology*. 38(1): 11-14.
- Thimmiah, D. 1989. Studies on effect of nitrogen, phosphorus and potassium on growth and yield of onion (*Allium cepa* L) Bellary Red. *M. Sc. (Agri). Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).
- Ullah, M.S., Islam, M.A., Islam, M.A. and Haque, T. 2008. Effect of organic manures and chemical fertilizers on the yield of brinjal and soil properties. *Journal of the Bangladesh Agricultural University*, 6(2): 271-276.
- Veeranna, H.K., Abdul Khalak, A.A., Farooqhi and Sujith, G.M. 2001. Effect of fertigation with normal and water soluble fertilizers compared to drip and furrow methods on yield, fertilizer and irrigation water use efficiency in chilli. *Micro Irrigation*, pp. 461-466.
- Vijayakumar, G., Tamilmani, D. and Selvaraj P.K. 2010. Irrigation and Fertigation Scheduling under Drip Irrigation in Brinjal (*Solanum melongena* L.) Crop. *International Journal of Biodiversity Science and Management*, 1(2): 72-76.
- Yadav, V.S. and Luthra, J.P. 2005. Effect of organic manures at different levels of phosphorus on yield and economics of vegetable pea. *Udyanika*, 11(2): 119-121.