The Journal of Rural and Agricultural Research Vol. 22 No. 2, 67-69 (2022)
Received September 2022; Acceptance November 2022

Response of growth and yield of onion (Allium cepa l.) to chemical fertilizers under irrigated conditions of Punjab

GURLAL SINGH AND HARPREET KAUR*
**Assistant Professor, Department of Agriculture, G.S.S.D.G.S Khalsa College Patiala, Punjab*
*Email: gurlal871@gmail.com, *preet20may@gmail.com*

Abstract

The present investigation on "Response of growth and yield of onion (Allium cepa L.) to chemical fertilizers under irrigated conditions of Punjab" was done during the Rabi season of 2021-2022 at Campus for Research and Advanced Studies, Dhablan, G.S.S.D.G.S. Khalsa College, Patiala. A field experiment was carried out in randomized block design (RBD) in which 10 treatments were applied in 3 replication. The maximum plant height (52.69 cm), number of leaves (8.04) and leaf length (44.98 cm) was observed with the treatment T9 (RDF 75 % + Sulphur bentonite 40 kg ha^{-1}) whereas maximum bulb diameter (9.81 cm), bulb weight ((87.45 g) and bulb yield (384.02 q ha^{-1}) was observed with the treatment T9 (RDF 75 % + Sulphur bentonite 40 kg ha^{-1}). The lowest values were recorded in treatment T1 (Control).

Keywords: Fertilizers, Growth, Onion, RDF, Sulphur bentonite and Yield

Introduction

Onion (Allium cepa L.) belongs to Alliaceae family. It is an important vegetable bulb crop mostly grown in tropical and subtropical part of world. It belongs to genus Allium of the family Alliaceae which is originated in southwest Asia and the Mediterranean regions. Onion is one of the oldest cultivated vegetable which traced back to at least 5000 year and been in cultivation for more than 4000 years. Onion as food, medicine and religious object was known during the first Egyptian dynasty in 3200 B.C. Onion, which is different from the other edible species of Alliums for its single bulb, is one of the most important bulb crops cultivated commercially in most parts of the world. It is usually propagate by true botanical seed (Gessesew et al. 2015). Onion is a rich source of calories, vitamin C and minerals, especially iron, phosphorus and calcium. It is also known to possess several medicinal properties. Its consumption helps in prevention and treatment of arthritis, coronary heart diseases, diabetes, cancer and asthma. Consumption of raw onion helps boosting good type cholesterol, reduce total cholesterol levels and increasing blood clot dissolving activity. A chemical compound called 'Quercetin' present in onion is a powerful antioxidant. The pungency in onion is due to a volatile substance called 'allyl propyl disulphide'. The pungency varies with cultivar, growing and storage conditions, bulb maturity etc. Red colour of onion is due to the pigment anthocyanin (Dhaliwal 2018).

Micronutrients are as important as the macronutrients in respect of their function in plants. The micronutrient required by plant includes iron, zinc and copper. Availability of micronutrient generally decreases as soil pH increases. Therefore, availability of Zn, Mn and Cu declines rapidly as soil pH rises. Although the requirement of a micronutrient is small as compare to a macronutrient, nevertheless micronutrients deficiency can limit the crop growth and production (Fouda 2017). Boron is one of the vital micronutrient for onion production and is essential for cell division, nitrogen and carbohydrate metabolism, protein formation and water relation in plant growth. Although it is quickly taken up from the soil and it is relatively immobile in plant. It is important to maintain the correct balance of calcium, nitrogen and boron within the soil. High calcium and excessive nitrogen levels can reduce boron uptake. Boron deficiency has been observed in soils with high organic matter contents (Chandan et al. 2021).

Materials and Methods

The field experiment entitled "Response of growth and yield of onion (Allium cepa L.) to chemical fertilizers under irrigated conditions of Punjab" was conducted during winter season of 2021-2022 at Campus for Research and Advanced Studies, Dhablan of G.S.S.D.G.S Khalsa College, Patiala. The experiment was conducted in Randomized Block Design with different application of chemical fertilizers with 3 replication and 10 treatments. The treatments were assigned randomly in the plot viz., T1(Control), T2 (RDF 100 %), T3 (RDF 75 %), T4 (RDF 50 %), T5(RDF 75 % + Zinc 5 kg ha^{-1}), T6(RDF 50% + Zinc 5 kg ha^{-1}), T7(RDF 75 % + Boron 3 kg ha^{-1}), T8(RDF 50 % + Boron 3 kg ha^{-1}), T9 (RDF 75 % + Sulphur Bentonite 40kg ha^{-1}) and T10 (RDF 50% + Sulphur Bentonite 40kg ha^{-1}).In this experimental trial Pro 6 variety was used. On 02nd October, 2021 seeds were sown in well prepared nursery bed with line sowing method. In about 35-40 days, seedlings become ready to transplant in experimental field. Healthy seedlings of uniform size were transplanted manually in each plot at 7.5 × 10 cm spacing.

Results and Discussion

Growth parameters

The data concerned with plant height, number of leaves and leaf length of bulb is presented in Table 1. The maximum plant height (52.69 cm), number of leaves (8.04) and leaf length (44.98 cm) was observed with the treatment T9 (RDF 75 % + Sulphur bentonite 40 kg ha^{-1}) which was at par plant height (50.84 cm), number of leaves (7.36) and leaf length (43.91cm) with treatment T5 (RDF 75% + Zinc 5 kg ha^{-1}) whereas the minimum plant height (40.41 cm), number of leaves (4.84), leaf length (32.96 cm) was obtained in treatment T1 (control). The results of this study clearly showed that onion responded favourably to fertilizer containing sulphur and RDF. The treatment T9 which showed the maximum plant height by using RDF and sulphur fertilizer together shows excellent performance.

The application of RDF increased plant height due to quick release of nutrients in the initial stage. Sulphur plays an important role in synthesis of chlorophyll which leads to photosynthesis process at good level and helps in enhancing the growth of plant. It also enhance the absorption of nitrogen fertilizer which is a main constitute of photosynthesis. Same result found in research which was done by Fraihat (2009), Fouda (2017) and Sharma and Singh (2018) in onion crop.

Yield parameters:

The data concerned with bulb diameter, bulb weight and bulb yield of onion is represented in Table 2. The maximum bulb diameter (9.81 cm), bulb weight (87.45 g) and bulb yield (384.02 q ha^{-1}) was observed with the treatment T9 (RDF 75 % + Sulphur bentonite 40 kg ha^{-1}) which was at par bulb diameter (9.81 cm), bulb weight (87.45 g) and bulb yield (384.02 q ha^{-1}) with treatment T5 (RDF 75% + Zinc 5 kg ha^{-1}) whereas the minimum bulb diameter(6.17 cm), bulb weight (72.17 g) and bulb yield (219.69 q ha^{-1}) was obtained in treatment T1 (control). Sulphur plays a crucial part in the development of plant proteins and certain hormones, which are also important for enzymatic activity, chlorophyll synthesis, and the synthesis of specific amino acids. It promotes the

Table 1: Effect of chemical fertilizers on growth parameters of onion

Treatments	Plant height (cm)	No. of leaves^{-1}	Leaf length (cm)
T1:Control	40.41	4.84	32.96
T2:RDF 100 %	48.76	6.98	41.63
T3:RDF 75 %	45.94	5.96	36.88
T4:RDF 50 %	44.51	5.81	36.03
T5:RDF 75% + Zinc 5 kg ha^{-1}	50.84	7.36	43.91
T6:RDF 50% + Zinc 5 kg ha^{-1}	47.84	6.49	38.87
T7:RDF 75 % + Boron 3 kg ha^{-1}	49.21	7.18	42.85
T8:RDF 50 + Boron 3 kg ha^{-1}	46.18	6.23	37.98
T9:RDF 75%+ Sulphur bentonite 40 kg ha^{-1}	52.69	8.04	44.98
T10:RDF 50%+ Sulphur bentonite 40 kg ha^{-1}	48.87	6.89	40.02
SE(d)±	0.84	0.30	0.51
CD at 5%	1.91	0.75	1.17

Table 2: Effect of chemical fertilizers on yield parameters of onion

Treatments	Bulb diameter (cm)	Bulb weight (g)	Bulb weight (qha^{-1})
T1:Control	6.17	72.17	219.69
T2:RDF100 %	8.65	79.37	354.53
T3:RDF75 %	7.32	78.43	315.56
T4:RDF50 %	7.02	77.45	303.19
T5:RDF 75 % + Zinc 5 kg ha^{-1}	9.68	86.23	375.67
T6:RDF 50 % + Zinc 5 kg ha^{-1}	8.06	81.35	336.49
T7:RDF 75 % + Boron3kg ha^{-1}	9.11	85.23	367.11
T8:RDF 50 % + Boron3kg ha^{-1}	7.68	80.54	328.24
T9:RDF 75 % + Sulphur bentonite 40 kg ha^{-1}	9.81	87.45	384.02
T10:RDF 50 % + Sulphur bentonite 40 kg ha^{-1}	8.35	83.05	348.55
SE(d)±	0.08	0.57	4.92
CD at 5%	0.18	1.29	11.12

uptake of N, a nutrient that is a component of chlorophyll. Sulphur helps in biochemical reactions and also act as catalyst for enzyme, potassium, phosphorous and nitrogen also improve onion yield. Higher yield obtained in combination of primary and secondary chemicals. Similar result was reported by and Babaleshwar et al. (2017) in garlic crop. Fraihat (2009), Sharma and Singh (2018) and Chandan et al. (2021) in onion reported that maximum bulb diameter was positively influenced by combination of NPK and sulphur.

Reference

Babaleshwar, S.R., Koppad, S.R., Math, K.K. and Dharmatti, R. (2017). Influence of sulphur on growth and yield of garlic. Journal of Pharmacognosy and phytochemistry. 6(5): 450-452.

Chandan, S., Kumar, P.L., Deepanshu (2021). Effect of Micronutrient Management Zinc and Boron on Crop Growth, Yield and Quality of Onion (Allium cepa L.). International Journal of Current Microbiology and Applied Sciences. 10(1): 2190-2195.

Dhaliwal, M.S. (2018). Handbook of Vegetable Crops. Pp: 177-179. Kalyani Publisher Ludhiana.

Fouda, K.F. (2017). Response of onion yield and its chemical content to NPK fertilization and foliar application of some micronutrients. Egyptian Journal soil science. 24(2) : 1-12.

Fraihat, A.H. (2009). Effect of different nitrogen and sulphur fertilizers levels on growth,yield and quality of onion (Allium cepa L.). Jordan Journal of Agricultural Sciences. 5(2): 156-165.

Gessesew, W.S., Woldetsadik, K. and Mohammed, W. (2015). Growth parameters of onion (Allium cepa L. var. Cepa) as affected by nitrogen fertilizer rates and intra-row spacing under irrigation in gode, South-Eastern Ethiopia. Agriculture forestry and fisheries. 4(6) : 239-245.

Sharma, M. and Singh, Y. (2018). Effect of foliar application of zinc sulphate on onion Journal Krishi Vigyan. 6(2): 43-45.