RESPONSE OF *RABI* ONION (*ALLIUM CEPA* L.) TO VARYING LEVELS OF NITROGEN UNDER SEMI-ARID CONDITIONS

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Abstract: An experiment was conducted to study the effected of different levels of nitrogen on yield attributes and yield of onion under semi arid conditions at Horticulture farm, S.K.N. College of Agriculture, Rajasthan Agricultural University, Jobner during *rabi* season. The experiment was comprised of three levels of nitrogen 50 kg ha^{-1}, 100 kg ha^{-1} and 150 kg ha^{-1}. The experiment was laid out in randomized block design with three replications. Onion variety RO-1 was taken up in experiment. Results of study revealed that application of 100 kg N ha^{-1} being at par with 150 kg N ha^{-1} significantly increased in yield attributes and yield of onion.

Keywords: Onion, Nitrogen, Yield, Economic

INTRODUCTION

Onion is one of the most important vegetable cum condiment crop grown throughout the world including India. Onion (*Allium cepa* L.) is a bulbous biennial herb of Alliaceae family. It is a unique vegetable that is used throughout the year in the form of salad or condiments or for cooking with other vegetables. Onion is also used in preparing soups, sauces, curries, pickles and for flavouring or seasoning foods. Onion bulbs have many medicinal properties. In India, the major onion producing states are Maharashtra, Gujarat, Karnataka, Andhra Pradesh, Bihar, Orissa, Tamil Nadu, Uttar Pradesh, Madhya Pradesh and Rajasthan. These states together accounted for 96 per cent of total area and production of onion in the country. It is evident now that nitrogen is the most deficient element. Availability of nitrogen is of prime importance for growing plants as it is major and indispensable constituent of protein and nucleic acid molecules. It is an integral part of chlorophyll molecules, which are responsible for photosynthesis. An adequate supply of nitrogen is associated with vigorous vegetative growth and more efficient use of available inputs finally leading to higher productivity. Patel *et al.* (1992) and Sharma (1992) reported that the application of nitrogen with different doses increased plant growth and yield of onion. Therefore, keeping all the points in view, the present study was under taken to evaluate the response of *rabi* onion (*Allium cepa* L.) to varying levels of nitrogen under semi-arid conditions.

MATERIAL AND METHOD

The experiment was laid out at Horticulture farm, S.K.N. College of Agriculture, Rajasthan Agricultural University, Jobner during *rabi* season 2009. Jobner is situated at 26.5^0 North latitude, 75.20^0 East longitude and an altitude of 427 metres above mean sea level, in Jaipur district of Rajasthan. This region falls under Agro-climatic zone IIIA (Semi-Arid Eastern Plain) of the state.

The climate of Jobner is typically semi arid characterized by extremes of temperature both in summer and winter with low rainfall and moderate relative humidity. Maximum temperature in summer is as high as 45 ^{0}C and minimum temperature in winters fall around 0 ^{0}C. The average rainfall of the locality is about 500 mm, most of which is received in rainy season from July to September. Yearly pan evaporation ranges from 1900-2000 mm. the soil was loamy sand in texture, slightly alkaline in reaction, poor in organic carbon with low available nitrogen, phosphorus and sulphur and medium in potassium status. The experiment was comprised of three levels of nitrogen 50 kg ha^{-1}, 100 kg ha^{-1} and 150 kg ha^{-1}. The experiment was laid out in randomized block design with three replications. Onion variety RO-1 was taken up in experiment.

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RESULT AND DISCUSSION

Yield attributes

The data regarding yield attributes including plant height, number of leaves per plant, weight of leaves per plant at harvest, neck thickness neck length, equatorial diameter, polar diameter, and number of scales per bulb are presented in Table 1. The data presented in table show that plant height of onion influenced significantly with application of nitrogen. Application of 100 kg N ha^{-1} resulted in significantly higher plant height in onion as compared to 50 kg N ha^{-1} but statistically at par with 150 kg N ha^{-1}. The per cent increase in plant height by the application of 150 kg N ha^{-1} was 17.33 and 5.86 over 50 and 100 kg N ha^{-1}, respectively.

It is obvious from the data in table that application of 150 kg N ha^{-1} produced significantly higher number of leaves per plant as compared to 50 kg N ha^{-1} while it was statistically at par with 100 kg N ha^{-1}. The per cent increase in the number of leaves per plant with

150 kg N ha^{-1} was 15.48 and 5.87 over 50 and 100 kg N ha^{-1}, respectively. The weight of leaves per plant at harvest was recorded significantly higher with the application of 150 kg N ha^{-1} over 50 kg N ha^{-1} but statistically at par with 100 kg N ha^{-1}.

A dose of 100 kg N ha^{-1} recorded significantly higher neck thickness over 50 kg N ha^{-1} but it was statistically at par with 150 kg N ha^{-1}. Application of 150 kg N ha^{-1} resulted in 11.23 and 3.12 per cent higher neck thickness over 50 and 100 kg N ha^{-1}, respectively. The data revealed that the maximum neck length was recorded with application of 150 kg N ha^{-1} being at par with 100 kg N ha^{-1} but both are found superior over 50 kg N ha^{-1}. The increase in neck length by the application of 150 kg N ha^{-1} over 50 and 100 kg N ha^{-1} was 9.74 and 3.48 per cent, respectively.

A dose of 150 kg N ha^{-1} recorded significantly higher equatorial diameter over 50 kg N ha^{-1} but it was statistically at par with 100 kg N ha^{-1}. Application of 150 kg N ha^{-1} resulted in 15.14 and 4.95 per cent higher equatorial diameter over 50 and 100 kg N ha^{-1}, respectively. the polar diameter significantly increase with the application of 100 kg N ha^{-1} which was significantly higher than 50 kg N ha^{-1} but statistically at par with 150 kg N ha^{-1}. The increase in polar diameter by the application of 150 kg N ha^{-1} over 50 and 100 kg N ha^{-1} was 13.48 and 4.94 per cent, respectively.

Application of 150 kg N ha^{-1} resulted in significantly higher number of scales per bulb as compared to 50 kg N ha^{-1} but statistically at par with 100 kg N ha^{-1}. The per cent increase recorded in number of scales per bulb by the application of 150 kg N ha^{-1} was 14.4 and 5.14 over 50 and 100 kg N ha^{-1}, respectively.

The significant improvement in yield attributes of onion with the nitrogen fertilization could be described to overall improvement in vigour of the crop growth. Since an adequate supply of nitrogen in the life of a plant is considered important in promoting rapid vegetative growth, number of leaves per plant, plant height and fresh weight of leaves thereby increasing the sink size in terms of bulb size. Thus, nitrogen fertilization stimulated neck thickness, bulb diameter and number of scales per bulb. Nitrogen application further helps in the translocation of photosynthates in storage organ of bulb resulting in increased diameter and weight of bulb.

Yield

The data pertaining to fresh weight of bulb, Volume of bulb and Bulb yield per hectare are presented in Table 2. It is evident that average fresh weight of individual bulb at harvest, volume of bulb and bulb yield per hectare were influenced significantly due to application of N. It is obvious from the data that increase in weight of bulb due to application of 150 kg N ha^{-1} was significantly higher over application of 50 kg N ha^{-1} while it was statistically at par with 100 kg N ha^{-1} and corresponding per cent increase was 16.17 and 5.70, respectively. Application of 150 kg N ha^{-1} significantly increased the volume of bulb over 50 kg N ha^{-1} but statistically at par with 100 kg N ha^{-1}. The higher value of (59.59 cc) bulb volume have been recorded with the application of 150 kg N ha^{-1} as compared to 52.12 cc and 56.68 cc over 50 and 100 kg N ha^{-1}, respectively. Data indicate that bulb yield of onion was increased significantly up to 100 kg N ha^{-1}. The highest bulb yield (247.25 q ha^{-1}) was recorded with the application of 150 kg N ha^{-1} which was significantly superior over 50 kg N ha^{-1}, while, it was statistically at par with 100 kg N ha^{-1}. The application of 100 kg N ha^{-1} increased the bulb yield over 50 kg N ha^{-1} by 23.29%.

The bulb yield, being a function primarily of the cumulative effect of these parameters, increased significantly by 232.43 q ha^{-1} (Table 2) with nitrogen fertilization led at 100 kg N ha^{-1} improved fresh weight of bulb and fresh weight of leaves as explained earlier with nitrogen fertilization led to significant improvement in biological yield and resulted in better source and sink relationship as a result of nitrogen application. The present trend of increase in bulb yield with application of nitrogen is in close conformity with the findings of Pandey *et al.* (1991) and Amin *et al.* (1995).

Table 1. Effect of different levels of nitrogen on yield attributes of onion

Treatments	Plant height (cm) at harvest	Number of leaves per plant at harvest	Fresh weight of leaves per plant at harvest (g)	Neck thickness of bulb (cm)	Neck length of bulb (cm)	Equatorial diameter (cm)	Polar diameter (cm)	Number of scales per bulb
N_{50}	38.94	5.62	21.72	0.89	5.95	5.15	4.30	6.25
N_{100}	43.16	6.13	23.60	0.96	6.31	5.65	4.65	6.80
N_{150}	45.69	6.49	24.78	0.99	6.53	5.93	4.88	7.15
S.Em ±	0.99	0.14	0.56	0.02	0.12	0.12	0.09	0.15
CD (P=0.05)	2.84	0.39	1.60	0.06	0.36	0.33	0.26	0.42

Table 2. Effect of different levels of nitrogen on fresh weight of bulb, volume of bulb, yield of bulb and economics

Treatments	Fresh weight of bulb (g)	Volume of bulb (cc)	Yield of bulb (q ha^{-1})	Net return (Rs ha^{-1})	B:C ratio
N_{50}	47.55	52.12	200.50	38514	1.78
N_{100}	52.26	56.68	232.43	47549	2.14
N_{150}	55.24	59.59	247.25	51452	2.26
S.Em $\pm$	1.00	1.17	6.02	1806	0.08
CD (P=0.05)	2.89	3.36	17.30	5191	0.23

Economics

It is explicit from data (Table 2) that application of 100 kg N ha^{-1} recorded significantly higher net return (Rs. 47549) and B:C ratio (2.14) compared to 50 kg N ha^{-1} (Rs. 38514 and 1.78), respectively. However, application of 150 kg ha^{-1} recorded maximum net returns and B:C ratio (Rs. 51452 and 2.26) being at par with 100 kg N ha^{-1}. The results of the present study clearly indicate that net returns and B:C ratio significantly increased with increasing levels of nitrogen upto 100 kg N ha^{-1}. The 100 kg N ha^{-1} recorded net return of Rs. 47549 ha^{-1} with a B:C ratio of 2.14. This may be ascribed due to increase in bulb yield significantly upto 100 kg N ha^{-1}.

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