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EFFECT OF DIFFERENT LEVELS OF NITROGEN ON ONION (*Allium cepa* L) UNDER THE AGRO-CLIMATIC CONDITION OF PESHAWAR

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Abstract

The response of onion (Allium cepa L) to different level of nitrogen was studied in Peshawar at Agriculture Research Institute Tarnab during 2015-2016. Nitrogen levels under trial were 0, 50, 100 and 150 kg per hectare. The statistical analysis revealed that different nitrogen levels significantly affected all the growth parameters studied. Maximum leaf length (54.48 cm), plant height (56.33 cm), average bulb weight (78.44 g), average bulb diameter (4.5cm), yield (14,000 kgha^{-1}) was recorded in plots fertilized with nitrogen @ 150 kgha^{-1}, whereas the average maximum number of leaves (6.93) were noted in plots that has received nitrogen @ 100 kgha^{-1}. It is concluded from the study that nitrogen @ 150 kgha^{-1} should be used for higher productivity of onion under agro-climatic conditions of Peshawar, Khyber Pakhtunkhwa.

Key words*: Onion (Allium cepa* L*), Yield, Nitrogen, Levels and Peshawar*

INTRODUCTION

Onion (*Allium cepa* L.) belongs to family *Amaryllidaceae*. Its bulb is a series of concentric swollen leaves attached to a short stem or base. These are surrounded by scales, which are dried leaves. It has been consumed throughout the world. It has special qualities, which add taste and flavor to food. It has been used in all the traditional cooking and culinary preparations. In addition, it is also consumed as salad with meals. Due to widespread consumption, onion has emerged as an important dietary item in daily food. It has an important nutritive value i.e., 100g of onion contain Protein (1.2g), Fat (0.1g) , Minerals (0.4g), Fiber (0.6g), Carbohydrates (11.1g), Energy (50 kcal), Calcium (46.9mg), Phosphorus (50mg), Vitamin C (11mg), and 1 mg Oxalic acid (Mumtaz, 2008). Onions are best cultivated in fertile soils that are well-drained. Sandy loams are good as they are low in sulphur, while clayey soils usually have high sulphur content and produce pungent bulbs (Abdissa et al., 2011). Nitrogen comprises 7% of total dry matter of plants and is a constituent of many fundamental cell components (Bungard et al., 1999). Nitrogen is essential to increase bulb size and yield, onion growers believed that excessive nitrogen prevented proper ripening and resulted in bulbs with poor storage quality (Sheikh et al., 1987).

Onions can be found in different colors like white, red, and yellow varieties, in different flavor like mild or pungent, in assorted shapes like globe or flat and also storing or non-storing types. The varieties of onion can be classified in short-day and long-day types as the day length can promote bulbing and influence the size of the bulb. Long-day onions begin to bulb with 14 or more hours of daylight while Short-day require 10 or 11 light hours. It can be grown from seeds or bulbs depending on the purpose and variety. Onion has diploid chromosomes number 2n=16 (Bassett, 1986). The pungency of the onion bulbs is due to the presence of a volatile oil that is allylpropyl disulfide (Baloch, 1994).

Pakistan is ranked 6thamong the leading onion producers of the world. China ranks first in world onion production followed by India, USA, Turkey, Pakistan, Iran, Indonesia, Vietnam and Myanmar etc. In Pakistan onion crop was grown over an area of 0.153 million hectares with a total production of 2.015 million tons while, its average yield per hectare was 13.2 tons. Khyber Pakhtunkhwa contributes 0.012 million hectares to the area under onion cultivation with a total production of 0.227 million tons. Balochistan, Punjab and Sindh cultivated onion crop on 0.046, 0.035 and 0.059 million hectares respectively with the total annual production of 0.743, 0.261 and 0.785 million tons. Yield per hectare in

KPK, Baluchistan, Punjab and Sindh were 18.92, 16.52, 7.29 and 13.30 respectively (Agriculture Statistics of Pakistan, 2009-2010).

Onion is broadly comsumed as condiment in the preparation of curry, chutney and pickle etc. due to which shortage of onionamy oftenly occours in Pakistan. Other factors contributing in its shortage are less area under cultivation, less yield per unit area and increase in demand due to the increse in population of the country (Jilani et al., 2004). This low production of onion is due to the less utilization of fertilizers especially the nitrogen and growing unsuitable varieties under the agro climatic conditions of an area. Optimum fertilizers application for onion and cultivation of suitable varieties in specific environment are necessary for obtaining good yield of onion (Jilani et al., 2004).

Keeping in view the low production of onion in the province the study was therefore, designed to evaluate the impact of different levels of nitrogen on the growth and yield of onion under agro-ecological conditions of Peshawar.

MATERIALS AND METHODS

Description of experimental site: The trail was carried out at Agriculture Research Institute Tarnab, Peshawar. The institute is located about 14 km east of Peshawar city, the capital of Khyber Pakhtunkhwa. The research institute is located at 34º N and 71.3º E having altitude of 450 m above sea level. Peshawar is located about 1600 km of north Indian Ocean and thus has a continental climate. The soil of the experimental site has 27% clay and 50% silt particle with pH value 7.7 - 8.0 and contained 1.06% organic matter with 0.053%, 22.1 and 186.0 mg kg^{-1} N, P and K respectively (Tariq Jan 2005).

Treatments and experimental design: An experiment titled "effect of different levels of Nitrogen on Onion under the Agro-climatic condition of Peshawar" was carried out at Agriculture Research Institute Tarnab Peshawar, during the year 2015-2016. The onion variety "Sawat-1" was used in the trial. Experimental treatments comprised of 0, 50, 100 and 150 kg Nha^{-1}. Urea was used as a source of nitrogen. The experiment was laid out in Randomized Complete Block Design (RCBD) having three replications. The nursery were planted in rows 20 cm apart with plant to plant distance 10 cm. All the other essential agronomic practices were carried out uniformly in each experimental unit.

Statistical analysis: The data was statistically analyzed according to Steel *et al.*(1996) for randomized complete block design and means among different treatment were composed using least significant differences (LSD) test ($P \leq 0.05$).

RESULTS AND DISCUSSION

Leaf length (cm): Table-1 revealed that nitrogen application had significantly affected the leaf length. Leaf length increased significantly by 0 to 150 kg Nha^{-1}. Maximum leaf length (54.48 cm) was found in the plants treated with 50 kg Nha^{-1} followed by leaf length (51.9 cm) with 100 kg Nha^{-1} while minimum leaf length (46.5 cm) was noted in the plants with control treatment (0 kg Nha^{-1}) . These results are in agreement with those of Kumar et al. (1998) who reported that application of Nitrogen at 150 kg ha $^{-1}$ resulted in maximum leaf length. This might be due to the fact that nitrogen is the integral part of chlorophyll and hence it help in the formation of photo assimilates which ultimately resulted in increased leaf length.

Plant height (cm): Plant height did not significantly affected by the nitrogen levels as indicated in Table 1. However, tallest plants (56.6 cm) was recorded in the experimental units that had received nitrogen @ 150 $kgha^{-1}$ while smallest plant (52.4 cm) was recorded in plots received control treatments. These results are also in line with Kumar et al. (1998), who reported that 150 kg Nha^{-1} resulted in tallest plants as compared to that obtained in control plots.

Number of leaves $plant^{-1}$: Results in (Table-1) regarding number of leaves $plant^{-1}$ indicated that nitrogen levels had significantly affected the studied parameter. Results revealed that maximum number of leaves $plant^{-1}$ (6.9) was noted in plots that were fertilized with nitrogen at the rate of 100 kg ha^{-1} while minimum number of leaves $plant^{-1}$ (5.6) was recorded in plots that received no nitrogen (control). These results are in agreement with Arshad et al (2003-2004) who reported that application of 100 kg N ha^{-1} produced maximum number of leaves $plant^{-1}$ in onion. The increase in number of leaves $plant^{-1}$ with increasing the nitrogen levels might be due to the verity that nitrogen play a key role in the enhancing of vegetative growth of the crop.

Bulb diameter (cm): Statistical analysis of the data presented in Table-1 indicated that the bulb diameter had significantly affected by different levels of nitrogen. Maximum bulb diameter (4.54 cm) was observed with the application of nitrogen @ 150 kg ha^{-1} while the minimum bulb weight (3.54 cm) was recorded with no nitrogen application. These results are in agreement with those of Kumar et al. (1998) who reported that application of Nitrogen at 150 kg ha^{-1} gave the best results regarding bulb diameter.

Bulb weight (g): Bulb weight (g) had significantly affected by different nitrogen levels as presented in the table. Maximum bulb weight (78.4 gm) was observed in the plots being fertilized with nitrogen at highest rate of 150 kg ha^{-1} while minimum average bulb weight (50.8 gm) was recorded in plots received no nitrogen. This may be due the fact that nitrogen supply to the plant increases the rate of metabolism, more carbohydrate is synthesized and thus increases bulb weight. In support of these finding, Kumar et al. (1998) reported that 150 $kgha^{-1}$ nitrogen resulted in maximum bulb weight.

Yield (kg ha^{-1}): It is evident from Table -1 that nitrogen levels had a significant affect regarding yield of Onion. The results revealed that maximum yield (14,000 $kgha^{-1}$) was noted when nitrogen was applied at the rate of 150 kg ha^{-1}, while minimum yield (8867 $kgha^{-1}$) was recorded in plots which received no nitrogen. The results are in agreements to the study of Kumar et al. (1998), who reported that maximum yield (kg ha^{-1}) was obtained when nitrogen was applied at a rate of 150 kg ha^{-1}. Similarly, Rizk (1997) reported that increasing N application rates generally increased all vegetative growth of onion.

Table-1. Data recorded on different agronomic parameters of onion as affected by various levels of N at Agriculture Research Institute Tarnab Peshawar during 2014.

Nitrogen Levels ($kgha^{-1}$)	Leaf Length (cm)	Plant Height (cm)	Leaves $plant^{-1}$	Bulb diameter (cm)	Bulb weight (gm)	Yield (kg ha^{-1})
Control	46.50d	52.46a	5.66b	3.54a	50.88c	8867c
50	50.03c	53.60a	6.46ab	4.06ab	62.77c	11133bc
100	51.97b	56.06a	6.93a	4.26a	77.11a	13533ab
150	54.48a	56.66a	6.86ab	4.54a	78.44a	14000a
LSD Value at P 0.05%	1.6536	6.7348	1.2153	0.6067	9.0636	2510.4

Any two means in their respective group not sharing a common letter (s) are significantly different using LSD test at 5% level of probability.

CONCLUSION AND RECOMMENDATIONS

It is concluded from the study that under the agro-climatic conditions of Peshawar valley the Onion crop will performed best when it fertilized with nitrogen @ 150 $kgha^{-1}$ with addition to adopting all the best agronomic practices essential for its production.

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