# Effect of nitrogen and potassium fertilization on the growth and yield of onions (Allium cepa L(.

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**Abstract**

The study was conducted at the Bakrajo Technical Institute field in 2021 using a Complete Randomized Block Design (CRBD). The experiment involved nine treatments and three replications. To evaluate the impact of two types of fertilizers proceeding onion (Allium cepa L.) white local' onion variety yield. Fertilizer Effects High doses of both (25 -50) Kg donum-1 of fertilizers significantly improved onion growth and yield of 14.07 (kg donum-1). This resulted in increased productivity and growth parameters, particularly with high-value fertilizer applications. Most growth and yield parameters showed positive responses to the fertilizer treatments, except for seed diameter and the number of bulbs per plant. A positive correlation was observed between the length of the onions and both onion diameter 46.46 (in cm) and yield. However, the relationship between growth and yield was substantial but non-significant. Both types of fertilizers had a beneficial effect on onion growth and yield, with higher doses being more effective. This suggests that optimal fertilizer application productivity. The seed diameter and the number of bulbs per plant did not show significant improvement with fertilizer application, indicating that these factors might be influenced by other variables or have a different response to fertilizer types. The positive correlation between onion length, diameter, and yield implies that as onions grow longer and thicker, their yield tends to increase. However, the non-significant relationship between growth and yield suggests that other factors beyond just growth parameters could influence the overall yield. Overall, your study underscores the importance of fertilizer application in improving onion yield and growth, while also highlighting that some parameters may not respond uniformly to changes in fertilizer dosage. Further research might explore the specific reasons behind the non-significant relationships and the impact on seed diameter and bulb count.

**Keywords: Nitrogen fertilizer, Potash fertilizer, Growth, Yield, (Allium cepa L), White onion**

## -1 Introduction

Onions (Allium cepa L.) are a major commercial crop worldwide. According to (1, 2 and 3), Onions developed in Asia and probably moved to the Near East. The vegetative leaves, complete immature plants known as 'salad onion', or leafy sprouts from germinating bulbs are all utilized in the same way. Throughout West Africa, green bulb gather leaves are utilized to produce matured balls (sun-dried) that may be applied to season dishes. Raw onions offer antibiotic characteristics that help prevent contamination in salads from bacteria, protozoa, and helminths (1). Nutrients have an important function in increasing the production and vegetables quality. Onions' short and unbranched root structure makes them vulnerable to nitrogen extraction, making

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fertilizer application beneficial (4, 5, and 6). To get a high onion production, it's important to use optimal fertilizer, cultivate acceptable varieties, and use proper agronomic procedures in the given area. (N) and (P) are known as the principal macronutrients since plants are likely to be deficient in these nutrients and absorb substantial amounts from the soil compared to other necessary elements (6). Nitrogen is critical for increasing onion bulb growth and output. Increasing nitrogen treatment rates improves plant height, green leaf count, bulb weight, trading yield, and soluble solids (total) (7, 8 and 9). The importance of potassium in several biological and physiological functions in plants, such as the processes of photosynthesis nutrient translocation, protein synthesis, water balance maintenance, and enzyme activity promotion, is well recognized (10). In practice, the relevance of K in relation to onion output and quality has been documented (11,12 and 13). An appropriate potassium concentration in the bulb is also critical for crop storage quality. K shortage in onions is characterized by brown tips on older leaves and poor bulb growth. The aim of this study is to evaluate the effects of potassium (K) and nitrogen (N) fertilizers on the growth and yield of onion (Allium cepa L.). By systematically analyzing various concentrations of these essential nutrients, the research seeks to determine their influence on key growth parameters such as bulb size, plant height, and overall biomass. Additionally, the study aims to assess how different fertilizer treatments impact onion production, including yield quantity and quality. Ultimately, the findings will provide insights into optimal fertilization strategies that enhance onion cultivation efficiency and contribute to sustainable agricultural practices.

Materials and Methods

The experiment was conducted at Bakrajo Technical Institute BTI agronomy field. Sulaimani city. It is situated at the 35° 33′ 40″N and 45° 26′ 14″E an altitude of 882 meters in the semi-arid climatic zone. The winter season is starts from November to end of June, with a standard precipitation of 250 – 700 mm. The mean temperature between 15 C to 35.

Experimental Materials

'White local' onion variety was applied for the study. The variety has light white bulb, vegetative leaf, flat globe bulb shape with white colure. The seeds planting until harvesting reached 115 days for bulb harvest. The cultivation starts from march to end of May 2021.

Fertilizer material

The types of the fertilizers were urea (N) and Kcl (K) fertilizer for supplying as follows: Recommended fertilizer needs typically range from 60 to 100 kg/ha of nitrogen (N), 25 to 45 kg/ha of phosphorus (P), and 45 to 80 kg/ha of potassium (K) (38.(

-1 T1 (0-0) Kg / donum N and K, 2- T2 (0-25) Kg / donum N and K, 3- T3 (25-25) Kg / donum N and K, 4- T4 (25-0) Kg / donum N and K, 5- T5 (0-50) Kg / donum N and K, 6- T6 (50-25) Kg / donum N and K, 7- T7 (50-0) Kg / donum N and K,8- T8 (25-50) Kg / donum N and K and 9- T9 (50-50) Kg / donum N and K applied each dose (2) time, one from cultivation and last one after 30 thirty days of planting .

Treatments and Experimental Design

The treatments consisted of three replications for each treatment and plot area with(3*3m) also each plot consist of 3 rows in the plot with 40 onion seed per row, distance between two seed onion 15 cm, finally distance between 2 plot 1m. The study followed a randomized complete block design (RCBD).

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Every treatment was allocated to the plots at random. Onion in a double row planted

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Soil Sampling and Analysis

The Bakrajo Technical agronomy field was collected. Soil samples were taken at random from 0 to 30 cm deep over the entire experimental field. The whole experimental field's worth of soil samples were gathered. A few chosen chemical characteristics of the soil were determined. In order to analyze the composite soil sample's physical and chemical characteristics, it was air dried, crushed, and sieved through a 2 mm sieve size. Using the sample, the following parameters were measured in the lab: total nitrogen, accessible potassium, organic matter, pH of the soil, and soil texture (Table 1.(

**Table10.Soil chemical properties**

| **pH** | **EC** | **$Na^+$** | **N%** | **$K^+$** | **$Ca^{2+}$** | **$Mg^{2+}$** | **O.M%** | **$CaCO_3$** |
|---|---|---|---|---|---|---|---|---|
| | $dSm^{-1}$ | $MeqL^{-1}$ | | | | | % | |
| 7.8 | 0.27 | 0.174 | 0.15 | 0.067 | 2.8 | 1.4 | 1.8 | 22.5 |

Data Collection

Data on growth, yield and yield components of onion were recorded from the plants which were selected randomly in each plot as specified in each plant characters as follows, Onion seed diameter(cm), Length of green onion leaf, number of Leaves per plant, number of bulbs per plant, shoots weight(gm)per plant, dry weight(gm)per plant and yield(kg/donum) growth parameters were taken from mid duration of experiment and yield measured at the end of the experiment.

Irrigation Water Quality

Irrigation water quality analyzed and assessed according to (14 and 15) suitable and good quality for irrigation as explained in appendix tables (1 and 2.(

Data Analysis

The results were analysis of variance (ANOVA) using XLSTAT 2019.2.2.59614. The Duncan Multiple Range Test (DMRT) was used to segregate and contrast the effects of treatment at a 5% probability level. Correlation analysis was computed to generate information about the association of yield and other parameters (37.(

.3Results and Discussions

Soil chemical characteristics normal range with little high carbonate calcium and slight alkaline pH also normal range of electrical conductivity which high conductivity cause to low production which explained in the table (1). Results explained in the table (2) summary least square means (LS means) – treatment of effect of nitrogen (N) and potash (K) fertilizers on growth and production of onion (Allium cepa L.) which explained various significant and non-significant data analysis .

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**Table 2. Summary (LS means) – Treatment of effect of potash (k) and nitrogen (n) Fertilizer on growth and production of onion (Allium cepa L(.**

| Treatments | Onion diameter (cm) | Length of onion (cm) | No. of Leaves plant$^{-1}$ | Number of bulbs plant$^{-1}$ | Shoots weight(gm) plant$^{-1}$ | Dry weight(gm) plant$^{-1}$ | Yield (kg/donum) |
|---|---|---|---|---|---|---|---|
| **T8** | 46.46 $^{ab}$ | 5.44 $^{ab}$ | 6.34 $^{a}$ | 2.67 $^{b}$ | 26.67 $^{a}$ | 11.734 $^{a}$ | 14.07 $^{b}$ |
| **T5** | 49.80 $^{ab}$ | 5.6 $^{a}$ | 5.34 $^{abc}$ | 2.67 $^{b}$ | 25.67 $^{a}$ | 11.30 $^{a}$ | 15.03 $^{a}$ |
| **T7** | 51.04 $^{ab}$ | 5.12 $^{bc}$ | 5.67 $^{ab}$ | 2.34 $^{b}$ | 27 $^{a}$ | 11.88 $^{a}$ | 13.22 $^{cd}$ |
| **T9** | 48.87 $^{ab}$ | 5.08 $^{c}$ | 5.67 $^{ab}$ | 4 $^{a}$ | 26.5 $^{a}$ | 11.66 $^{a}$ | 10.67 $^{f}$ |
| **T6** | 54.64 a | 5.47 $^{ab}$ | 4.67 $^{bcd}$ | 3.34 $^{ab}$ | 23.34 $^{b}$ | 10.27 $^{b}$ | 12.54 $^{de}$ |
| **T4** | 51.75 $^{ab}$ | 5.32 $^{abc}$ | 4.67 $^{bcd}$ | 3.34 $^{ab}$ | 23.67 $^{b}$ | 10.42 $^{b}$ | 12.53$^{de}$ |
| **T3** | 46.56 $^{ab}$ | 5.26 $^{abc}$ | 4 $^{d}$ | 3.34 $^{ab}$ | 25.5 $^{a}$ | 11.22 $^{a}$ | 13.89 $^{bc}$ |
| **T1** | 54.62 $^{a}$ | 5.47 $^{ab}$ | 5.34 $^{abc}$ | 2.34 $^{b}$ | 19.34 $^{d}$ | 8.51 $^{d}$ | 13.8 $^{bc}$ |
| **T2** | 44.02 $^{b}$ | 4.98 $^{c}$ | 4.34 $^{cd}$ | 2.67 $^{b}$ | 21.67 $^{c}$ | 9.54 $^{c}$ | 12.1 $^{e}$ |
| **Pr > F(Treatment)** | 0.085 | 0.008 | 0.002 | 0.065 | < 0.0001 | < 0.0001 | < 0.0001 |
| **Significant** | **No** | **Yes** | **Yes** | **No** | **Yes** | **Yes** | **Yes** |

Values followed by the same letter(s) within each column are significantly not different according to Duncan's multiple range test (P≤0.05.(

Effect of potash (k) and nitrogen (n) Fertilizer on growth and production of onion (Allium cepa L.) on onion diameter(cm(

Tables (2 and 3) explained non-significant effect of (k) and (N) fertilizer on growth and production of onion (Allium cepa L.) on onion diameter(cm), which, data recorded (T8, T5, T7, T9, T6, T4, T3, T1, and T2) with least square means (46.46 ab, 49.80 ab, 51.04 ab, 48.87 ab, 54.64 a, 51.75 ab, 46.56 ab, 54.62 a and 44.02 b) respectively, with sum of squares (366.39) and mean squares (36.64).on the other hand for the same effect of non-significant effect of potash (k) and nitrogen (n) fertilizer on growth and production of onion (Allium cepa L.) on onion diameter(cm), data analyzed to different groups as represented table (4) as for group A (T6 and T1) with least

square means values (54.64 and 54.62),Next group (AB) for treatment (T4, T7, T5, T9, T3, and T8) with least square means (51.75, 51.04, 49.80, 48.88, 46.56, and 46.46),finally group B for treatment T2 and least square mean value 44.02.the results shows that parallel with researches (16, 17, 18, and 19 .(

**Table 3. Analysis of variance of effect of potash (k) and nitrogen (n) Fertilizer on growth and production of onion (Allium cepa L.) on Onion diameter(cm(**

| Source | DF | Sum of squares | Mean squares | F | Pr > F |
|---|---|---|---|---|---|
| **Model** | 10 | 366.39 | 36.64 | 1.99 | 0.105 |
| **Error** | 16 | 293.95 | 18.37 | | |
| **Corrected Total** | 26 | 660.34 | | | |
| ***Computed against model Y=Mean(Y)*** | | | | | |

**Table 4. Summary of LS means of onion diameter(cm)) comparisons for treatment (duncan(**

| Treatments | LS means (Onion Diameter(cm)) | Groups | |
|---|---|---|---|
| **T6** | 54.64 | A | |
| **T1** | 54.62 | A | |
| **T4** | 51.75 | A | B |
| **T7** | 51.04 | A | B |
| **T5** | 49.80 | A | B |
| **T9** | 48.88 | A | B |
| **T3** | 46.56 | A | B |
| **T8** | 46.46 | A | B |
| **T2** | 44.02 | | B |

Effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on length of onion(cm(

Tables (2 and 5) represented significant effect of nitrogen (N) and potash (k) fertilizer on growth and production of onion (Allium cepa L.) on length of onion(cm) which, data recorded (T8, T5, T7, T9, T6, T4, T3, T1, and T2) with least square means (5.44 ab, 5.6 a, 5.12 bc, 5.08 c, 5.47 ab, 5.32 abc, 5.26 abc, 5.47 ab, and 4.98 c) respectively. with sum of squares (1.19) and mean squares (0.102). On the other hand, for the same effect of non-significant effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on length of onion(cm), data analyzed to various groups as explained in the table (6) as for group A (T5) with least square means values (5.60), Next group (AB) for treatment (T1, T6, and T8) with least square means (5.47, 5.47, and 5.44), Later group (ABC) which treatment of T4 and T3 with least square means 5.32 and 5.26.Finally group C for treatment T9 and T2

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least square mean values 5.08 and 4.98.thats mean the study agree with ( 20 and 21.(

**Table 5. Analysis of variance of effect of potash (k) and nitrogen (n) fertilizer on growth and production of onion (Allium cepa L.) on length of onion(cm(**

| Source | DF | Sum of squares | Mean squares | F | Pr > F |
|---|---|---|---|---|---|
| **Model** | 10 | 1.19 | 0.102 | 3.60 | **0.011** |
| **Error** | 16 | 0.53 | 0.04 | | |
| **Corrected Total** | 26 | 1.71 | | | |
| ***Computed against model Y=Mean(Y)*** | | | | | |

**Table 6. Summary of LS means length of onion(cm) comparisons for treatment (Duncan**)

| Treatments | LS means of length of onion (cm) | Groups | | |
|---|---|---|---|---|
| **T5** | 5.60 | A | | |
| **T1** | 5.47 | A | B | |
| **T6** | 5.47 | A | B | |
| **T8** | 5.44 | A | B | |
| **T4** | 5.32 | A | B | C |
| **T3** | 5.26 | A | B | C |
| **T7** | 5.12 | | B | C |
| **T9** | 5.08 | | | C |
| **T2** | 4.98 | | | C |

Effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on number of leaves per plant

Tables (2 and 7) represented significant effect of nitrogen (N) and potash (k) fertilizer on growth and production of onion (Allium cepa L.) on number of Leaves per plant which, data recorded (T8, T5, T7, T9, T6, T4, T3, T1, and T2) with least square means (6.34 a, 5.34 abc, 5.67 ab, 5.67 ab, 4.67 bcd, 4.67 bcd, 4 d, 5.34 abc and 4.34 cd) respectively. with sum of squares (17.56) and mean squares (1.76). On the other hand, for the same effect of significant effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on number of Leaves per plant, data analyzed to various groups as illustrated in the table (8) as for group A (T8) with least square means values (6.33), Next group (AB) for treatment (T7and T9) with least square means (5.67 and 5.67), Later group (ABC) which treatment of T1 and T5 with least square means 5.33 and 5.33. Otherwise, group (BCD) recorded for treatment T4 and T6 with least square means 4.67 and 4.67. also, group (CD) for treatment T2 which LS mean 4.33. Finally group D for treatment T3 least square mean value 4. The results indicated that accept with study (19, 22 and 23.(

**Table 7. Analysis of variance of effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on (number of Leaves per plant(**

| Source | DF | Sum of squares | Mean squares | F | Pr > F |
|---|---|---|---|---|---|
| **Model** | 10 | 17.56 | 1.76 | 5.50 | **0.001** |
| **Error** | 16 | 5.11 | 0.41 | | |
| **Corrected Total** | 26 | 22.67 | | | |
| ***Computed against model Y=Mean(Y)*** | | | | | |

**Table 8. Summary of LS means of number of leaves per plant comparisons for treatment (Duncan(**

| Treatments | LS means (No. of Leaves per plant) | Groups | | | |
|---|---|---|---|---|---|
| **T8** | 6.33 | A | | | |
| **T7** | 5.67 | A | B | | |
| **T9** | 5.67 | A | B | | |
| **T1** | 5.33 | A | B | C | |
| **T5** | 5.33 | A | B | C | |
| **T4** | 4.67 | | B | C | D |
| **T6** | 4.67 | | B | C | D |
| **T2** | 4.33 | | | C | D |
| **T3** | 4.00 | | | | D |

Effect of potash (K) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on number of bulbs per plant

Tables (2 and 9) explained non - significant effect of nitrogen (N) and potash (k) fertilizer on growth and production of onion (Allium cepa L.) on number of bulbs per plant which, data recorded (T8, T5, T7, T9, T6, T4, T3, T1, and T2) with least square means (2.67 b, 2.67 b, 2.34 b, 4 a, 3.34 ab, 3.34 ab, 3.34 ab, 2.34 b and 2.67 b) respectively. with sum of squares (8.59) and mean squares (0.86). On the other hand, for the same effect of non -significant effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on number of bulbs per plant, data analyzed to different groups as show in the table (10) as for group A (T9) with least square means values (4), Next group (AB) for treatment (T3, T4 and T6) with least square means (3.33, 3.33 and 3.33) , Later group (B) which treatment of T2, T5, T8, T7,and T51 with least square means 2.67, 2.67, 2.67, 2.33 and 2.33 its mean results parallel with (24, 25, 26 and 27.(

**Table 9. Analysis of variance of effect of potash (k) and nitrogen (n) Fertilizer on growth and production of onion (Allium cepa L.) on number of bulbs per plant**

| Source | DF | Sum of squares | Mean squares | F | Pr > F |
|---|---|---|---|---|---|
| **Model** | 10 | 8.59 | 0.86 | 2.16 | 0.082 |
| **Error** | 16 | 6.37 | 0.40 | | |
| **Corrected Total** | 26 | 14.96 | | | |
| ***Computed against model Y=Mean(Y)*** | | | | | |

**Table 10. Summary of least square means of number of bulbs per plant comparisons for treatment (Duncan(**

| Treatments | LS means | Groups | |
|---|---|---|---|
| **T9** | 4.00 | A | |
| **T3** | 3.33 | A | B |
| **T4** | 3.33 | A | B |
| **T6** | 3.33 | A | B |
| **T2** | 2.67 | | B |
| **T5** | 2.67 | | B |
| **T8** | 2.67 | | B |
| **T7** | 2.33 | | B |
| **T1** | 2.33 | | B |

Effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on shoots weight(gm)per plant

Tables (2 and 11) explained significant effect of nitrogen (N) and potash (k) fertilizer on growth and production of onion (Allium cepa L.) on shoots weight(gm) per plant which, data recorded (T8, T5, T7, T9, T6, T4, T3, T1, and T2) and least square means (26.67 a, 25.67 a, 27 a, 26.5 a, 23.34 b, 23.67 b, 25.5 a, 19.34 d and 21.67 c) respectively. with sum of squares (162.37) and mean squares (16.24). On the other hand, for the same effect of significant effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on shoots weight(gm)per plant, data analyzed to various groups as show in the table (12) as for group A (T7, T8, T9, T5, and T3) and least square means values (27, 26.67, 26.50, 25.67, and 25.50), later group (B) for treatment (T4, and T6) with least square means (23.67, and 23.33) , next group (C) which treatment of T2 with least square means 21.67. finally group D for treatment T1 and LS means 19.33. The results explain that research study accept with (28, 29 and 30.(

**Table 11. Analysis of variance of effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on shoots weight(gm)per plant**

| **Source** | **DF** | **Sum of squares** | **Mean squares** | **F** | **Pr > F** |
|---|---|---|---|---|---|
| **Model** | 10 | 162.37 | 16.24 | 20.91 | **< 0.0001** |
| **Error** | 16 | 12.43 | 0.78 | | |
| **Corrected Total** | 26 | 174.80 | | | |
| ***Computed against model Y=Mean(Y)*** | | | | | |

**Table 12. Summary of LS means of shoots weight(gm)per plant comparisons for treatment (Duncan(**

| **Treatments** | **LS means** | **Groups** | | | |
|---|---|---|---|---|---|
| **T7** | 27.00 | A | | | |
| **T8** | 26.67 | A | | | |
| **T9** | 26.50 | A | | | |
| **T5** | 25.67 | A | | | |
| **T3** | 25.50 | A | | | |
| **T4** | 23.67 | | B | | |
| **T6** | 23.33 | | B | | |
| **T2** | 21.67 | | | C | |
| **T1** | 19.33 | | | | D |

Effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on dry weight(gm)per plant

Tables (2 and 13) explained significant effect of nitrogen (N) and potash (k) fertilizer on growth and production of onion (Allium cepa L.) on dry weight(gm)per plant which, data recorded (T8, T5, T7, T9, T6, T4, T3, T1, and T2) and least square means (11.734 a, 11.30 a, 11.88 a, 11.66 a, 10.27 b, 10.42 b, 11.22 a, 8.51 d and 9.54 c) respectively. with sum of squares (31.43) and mean squares (3.14). On the other hand, for the same effect of significant effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on dry weight(gm)per plant, data analyzed to various groups as show in the table (14) as for group A (T7, T8, T9, T5, and T3) and least square means values (11.88, 11.73, 11.66, 11.29, and 11.22), Next group (B) for treatment (T4, and T6) with least square means (10.41, and 10.27) , next group (C) which treatment of T2 with least square means 9.53. finally group D for treatment T1 and LS means 8.51. The results represent that accepts with front study of (25 and16 .(

**Table 13. Analysis of variance of effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on dry weight(gm)per plant**

| Source | DF | Sum of squares | Mean squares | F | Pr > F |
|---|---|---|---|---|---|
| **Model** | 10 | 31.43 | 3.14 | 20.91 | **< 0.0001** |
| **Error** | 16 | 2.41 | 0.15 | | |
| **Corrected Total** | 26 | 33.84 | | | |
| ***Computed against model Y=Mean(Y)*** | | | | | |

**Table 14. Summary of LS means of dry weight(gm)per plant) comparisons for treatment (Duncan(**

| Treatments | LS means | Groups | | | |
|---|---|---|---|---|---|
| **T7** | 11.88 | A | | | |
| **T8** | 11.73 | A | | | |
| **T9** | 11.66 | A | | | |
| **T5** | 11.29 | A | | | |
| **T3** | 11.22 | A | | | |
| **T4** | 10.41 | | B | | |
| **T6** | 10.27 | | B | | |
| **T2** | 9.53 | | | C | |
| **T1** | 8.51 | | | | D |

Effect of potash (k) and nitrogen (n) fertilizer on growth and production of onion (Allium cepa L.) on yield(kg/donum(

Tables (2 and 15) explained significant effect of nitrogen (N) and potash (k) fertilizer on growth and production of onion (Allium cepa L.) on yield(kg/donum) which, data recorded (T8, T5, T7, T9, T6, T4, T3, T1, and T2) and least square means (14.07 b, 15.03 a, 13.22 cd, 10.67 f, 12.54 de, 12.53de, 13.89 bc, 13.8 bc and 12.1 e) respectively. with sum of squares (40.30) and mean squares (4.03). On the other hand, for the same effect of significant effect of potash (k) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on yield(kg/donum) , data analyzed to various groups as show in the table (16) as for group A (T5) and least square means values (15.03), Next group (B) for treatment (T8) with least square means (14.07) ,otherwise group (BC) which treatment of T3 and T1 with least square means (13.88 and 13.80) .later group (CD) for treatment T7 and LS means 13.22 , other group (DE) and treatments T6 and T4 with LS means 12.53 and 12.53,Later group E for treatment T2 and LS means 12.10 finally group F for treatment T9 and LS means 10.67. Results agree with study (31 and 32 .(

**Table 15. Analysis of variance of effect of potash (K) and nitrogen (N) fertilizer on growth and production of onion (Allium cepa L.) on yield(kg/donum(**

| Source | DF | Sum of squares | Mean squares | F | Pr > F |
|---|---|---|---|---|---|
| Model | 10 | 40.30 | 4.03 | 25.50 | **< 0.0001** |
| Error | 16 | 2.53 | 0.16 | | |
| Corrected Total | 26 | 42.83 | | | |
| ***Computed against model Y=Mean(Y)*** | | | | | |

**Table 16. Summary of LS means of yield(kg/donum) comparisons for treatment (Duncan(**

| **Treatments** | **LS means** | **Groups** | | | | | |
|---|---|---|---|---|---|---|---|
| **T5** | 15.03 | A | | | | | |
| **T8** | 14.07 | | B | | | | |
| **T3** | 13.88 | | B | C | | | |
| **T1** | 13.80 | | B | C | | | |
| **T7** | 13.22 | | | C | D | | |
| **T6** | 12.53 | | | | D | E | |
| **T4** | 12.53 | | | | D | E | |
| **T2** | 12.10 | | | | | E | |
| **T9** | 10.67 | | | | | | F |

Correlation coefficient relation matrix between seven characteristics of (Allium cepa L.) of effects of potash (K) and nitrogen (N) fertilizer

Data analysis table 16 explained correlation coefficient relation matrix between seven characteristics of (Allium cepa L.) under effects of potash (K) and nitrogen (N) fertilizer. most positive significant between Length of onion with each of Onion diameter(cm) and yield (kg/donum) with r values (0.45 and 0.65) respectively (33 and 34). But negative significant recorded between yield (kg/donum) and number of bulbs per plant with r value -0.42. On the other hand, negative and positive non -significant relation recorded between growth and yield parameters as the effects of both type fertilizers with different doses as mentioned above due the answer of plant to the fertilizers results show agree with (35 and 36.(

**Table 16. Correlation coefficient relation matrix between seven characteristics of (Allium cepa L(.**

| Variables | Onion Diameter(cm) | Length of onion | No. of Leaves per plant | Number of bulbs per plant | Shoots weight(gm) per plant | Dry weight (gm)per plant | Yield (kg/d |
|---|---|---|---|---|---|---|---|
| **Onion Diameter(cm)** | **1** | | | | | | |
| **Length of onion** | **0.45** | **1** | | | | | |
| **No. of Leaves per plant** | 0.14 | 0.10 | **1** | | | | |
| **Number of bulbest per plant** | -0.12 | -0.13 | 0.12 | **1** | | | |
| **Shoots weight(gm)per plant** | -0.24 | -0.09 | 0.31 | 0.21 | **1** | | |
| **Dry weight(gm)per plant** | -0.24 | -0.09 | 0.31 | 0.21 | **1.000** | **1** | |
| **Yield (kg/donum)** | 0.07 | **0.62** | 0.09 | **-0.42** | 0.04 | 0.04 | **1** |
| ***Values in bold are different from 0 with a significance level alpha=0.05*** | | | | | | | |

## Conclusion

This study found positive significant results for onion number of leaves per plant Shoots weight(gm)per plant and other growth and yield parameters and non-significant recorded for onion diameter and bulbs number. Its mean application mineral fertilizers for both types recorded positive answer with different doses

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comparison to control application which without any types of fertilizers application.
To conclude the study results indicated that increased growth with increase fertilizer application and maximum results recorded for high concentration of fertilizer used
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**Appendix table 1. Irrigation water analysis**

| **pH** | **EC** | **$Ca^{2+}$** | **$Mg^{2+}$** | **Na+** | **K+** | **$CO_3^{2-}$** | **$HCO_3^-$** | **$Cl^-$** | **$NO_3^-$** | **$SO_4^{2-}$** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **(dS $m^{-1}$)** | **Meq $L^{-1}$** | | | | | | | | |
| 7.3 | 0.211 | 4 | 3.6 | 0.222 | 0.030 | 0 | 3.67 | 0.6 | 0.2 | 2.67 |

**Appendix table 2. Irrigation water quality**

| **Irrigation Water quality Index according to modified (Marif, A. and Esmael, A., 2023)** | | **Irrigation Water quality Index according to (Ayers &Westcot,1985)** |
|---|---|---|
| **Value** | **Class** | **Class** |
| 71 – 90 | Good | **No restriction (NR)** |

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