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# EFFECT OF ORGANIC AND MINERAL FERTILIZERS ON YIELD AND QUALITY OF SORGHUM UNDER SANDY SOIL CONDITIONS

**Salwa A.A. Hassanen[(1)] and H. H. Abotaleb[(2)]**

1-The Central lab. of Organic Agriculture, Agricultural Research Center (A R C). Giza, Egypt.

2-Microbial, Res. Dept, Soil, Water and Environment Institute, (ARC). Giza, Egypt.

**1- Email – salwahassanen@yahoo.com**

**Key Words:** Organic compositions, mineral fertilizers, sandy soil, sorghum, productivity and quality.

## ABSTRACT

A field experiment was conducted in sandy soil at Fayoum Government in Egypt, during the two summer seasons of 2019 and 2020. The objective of this experiment was to study the response of sorghum (Hybrid 305) to foliar application with some organic compositions (Ascorbic acid and potassium silicate) under different four mineral fertilizers (25, 50, 75 and 100 %) comparing with the four mineral fertilizers without spraying. Plants were sprayed with ascorbic acid at rate of 500 ppm/ L and 6 m / L of potassium silicate at three periods (21, 45 and 60 days from sowing). Results should that application of foliar ascorbic acid and potassium silicate on sorghum produced significant increases in the studied characters comparing with the untreated plants. The treatment (75 % N + potassium silicate) achieved the earlier in flowering, the highest values of grain weight / head and the highest values of grain yield (22.55 ardab / fed) and the nutrients content in grains this treatment obtained the higher values (10.38, 0.490 and 0.436 % for protein, P and K, respectively compared with the treatment (100 % N without spray).The treatment (100 N % + potassium silicate) increased no. of days to 50 % flowering, gave the highest values of plant height, stem diameter, number and area of leaves, 1000 – grain weight and the highest value of green yield (12.40 ton / fed) compared with the treatment (100 % N without spray). Therefor it is possible to grow sorghum under sandy soil and increase grain yield and its nutrients content also reduce environmental pollution with reduce 25 % of mineral fertilizer by using some organic compositions (potassium silicate).

## INTRODUCTION

Grain sorghum (*sorghum bicolor* L.) is grown in many tropical and subtropical regions of the world, because of its tolerant to stress conditions such as drought, salinity and high temperature (**Bashir *et al.*, 1994**). Mineral fertilizers used to increase grain sorghum yield (**Saba *et al.*, 1990**). But on the other hand, the excessive application led to raise

cost of crop production and caused higher environmental pollution. Application of some growth promoting agents (potassium silicate and Ascorbic acid), Can help to decrease the amount of using mineral fertilizers, humeral effect as well as increased grain yield production and quality (**Maged *et al.*, 2018 and Udeigwe *et al.*, 2015**). The role of potassium silicate in plant biology is to reduce multiple stress including biotic and abiotic stress and it is also known to increase drought tolerance in plants by maintaining plant water balance, photosynthetic activity, erectness of leaves and structure of xylem vessles under high transpiration rates (**Matoh *et al.*, 1991, Melo *et al.*, 2003, Gong *et al.*, 2006 and Kumbargire *et al.* 2016).** Ascorbic acid is synthesized in most of higher plants and it is had an important role in both product of D-glucose metabolism and the electron transport system. Application of ascorbic acid led to gave increasing values of plant vegetative growth as well as grain yield production of sorghum (**Anton *et al.*, 1999 and Mourad 2006**). The present experiment was carried out to study the response of sorghum plant to foliar application of potassium silicate and ascorbic acid under different rates of mineral fertilizers on growth, N P K uptake and yield production.

## MATERIALS AND METHODS

A field experiment was conducted in sandy soil at own farm, Fayoum Government during the two successive seasons 2019 and 2020 to study the response of sorghum Hybrid 305 to foliar application with some organic compositions under different levels of mineral fertilizer comparing with the levels mineral fertilizer alone (without spray). The genotype was used hybrid 305 and kindly obtained from sorghum Res. Dept. field crops, Res. Inst., ARC. Egypt. Sandy soil was used and some soil properties were found in Table (1) according to **Jakson 1973**.

Plants were sprayed with ascorbic acid at rate 500 ppm and potassium silicate (silicon oxide + potassium oxide) with rate 6 m / L, at three times after 21, 45 and 60 days from sowing. The four levels of mineral nitrogen were 25, 50, 75 and 100 % N / fed and added at sowing date (11 and 18 June in 2019 and 2020 seasons). Nitrogen as ammonium nitrate (33.5 % N) was divided into four dose for all nitrogen levels. Phosphorus and potassium fertilizers at the rate of 30 kg P2 O5 / fed and 24 kg K2O/fed in the form of calcium supper phosphate and potassium sulphate (48 % K2O), respectively. Randomized complete block design with three replication was used in both seasons with the following treatments:

T1 25 % N / fed
T2 25 N / fed + Ascorbic Acid
T3 25 % N / fed + potassium silicate
T4 50 % N / fed

T5 50 % N / fed + Ascorbic acid
T6 50 % N / fed + potassium silicate
T7 75 % N / fed
T8 75 % N / fed + Ascorbic Acid
T9 75 % N / fed + potassium silicate
T10 100 % N / fed (120 kg N / fed)
T11 100 % N / fed + Ascorbic Acid
T12 100 % N / fed + potassium silicate

**Table (1): Some physical and chemical soil properties of the experimental site**

| Properties | Values |
|---|---|
| **Mechanical analysis** | |
| **Sand (%)** | **69.30** |
| **Salt (%)** | **18.70** |
| **Clay (%)** | **12.00** |
| **Texture grade** | **Sandy Loam** |
| **Physical – chemical analysis** | |
| **PH (Soil paste)** | **7.28** |
| **E.C ($dsm^{-1}$ at 25 $^{o}C$** | **1.02** |
| **Saturation %** | **33** |
| **Organic matter (%)** | **0.73** |
| **Total Nitrogen (%)** | **0.014** |
| **Total soluble N (ppm)** | **45** |
| **Total Soluble p (ppm)** | **5.10** |
| **Total Soluble K (ppm)** | **4.34** |
| **Soluble cations and anions ($MgL^{-1}$)** | |
| **$Ca^{++}$** | **2.10** |
| **$Mg^{++}$** | **2.21** |
| **$Na^{+}$** | **6.10** |
| **$K^{+}$** | **0.51** |
| **$Co3^{-}$** | **3.05** |
| **$C1^{-}$** | **3.57** |
| **$So4^{=}$** | **4.0** |

Plot size was 3 x 3.5 m; planting was done in hills 20 cm apart on one side of the ridge. Number of grains per hill was 5 – 8 grains, after 18 days from planting dates. Weed control was performed by hoeing and seedlings were thinned to two plants per hill. Plant height, stem diameter, leaves number, (number of days from sowing to 50% flowering) and Total leave Area /plant $(cm)^2$ of the $4^{th}$ leaf = Leaf length (cm) x maximum leaf width (cm) x (0.747) multiplied of no. of green leaves according to **Stickler *et al.*, (1961).** At harvest time (120 days age) from each plot (two central rows) 20 heads were taken at random for air drying (10 days), then threshed and grain weight per head (gm), 1000- grain weight (gm), green yield ton per feddan and grain yield per feddan (ardab) as well as Protein content (%) and P and K (%) uptake according to **page *et al.*, 1982**. Statistical analysis of the results was performed by

using analysis of variance ANOVA and least significant differences (L. S. D.) were calculated from ANOVA tables according to **Steal and Torrie (1984)**.

## RESULTS AND DISCUSSION

**Plant growth characters:**

Results in Table (2) show effect of various treatments on plant height, stem diameter and number of days to 50% flowering. The results showed that increasing nitrogen- levels from 25 to 100% increased plant height (from 103 to 140 cm) and also stem diameter (from 9.05 to 11.50 m) and number of days to 50% flowering from 65.30 to 69.30 day. Also the results should that foliar application of ascorbic acid and potassium silicate led to significant increase comparing with untreated plants (6.4% and 9.3%) for plant height and 5.2% and 7.0% for stem diameter. The highest values of plant height were recorded at the two treatments 100% N-mineral + ascorbic acid and 100% N-mineral + potassium silicate (149 and 153 cm), respectively, compared with 100% N-mineral without spray, its value was 140 cm, and the corresponding values for stem diameter were (12.10 and 12.30 cm), while the value produced from 100 % N-mineral was 11.50 cm, as well as number of days to 50% flowering increased (71.15 and 70.50 days), respectively, but the treatment which 75% - N + Ascorbic acid and the treatment which received 75% N + potassium silicate reduced days to 50% flowering (66.00 and 65.85 days) towards earliness, respectively compared with 75% N/fed similar results were reported by **(Conklin 2001, Gunes *et al.*, 2008, Rabie and Negm 1992 and Abdel-Messih and Eid 1999),** who reported the importance of silicon to prevent of plant lodging and increase of grain yield.

Results of leaves number and leaves area are presented in Table (3) the obtained data indicated that the treatments of 25, 50, 75, 100% N-mineral produce (4.25, 5.00, 6.00 and 6.85) and (383, 603, 617 and 671 $cm^2$) for number and area of leaves, respectively. Also foliar application of ascorbic acid and potassium silicate achieved significant increase (7.2% and 8.7%) for no. of leaves and (9.2% and 21.2%) for leaves area. The highest values for leaves number and leaves area were found at the treatment which received 100% N + Ascorbic acid and the treatment 100% N + potassium silicate with values for number of green leaves were (7.35 and 7.50), respectively compared with 100% N without spray which gave (6.85) and the corresponding values for leaves area (733 and 813 $cm^2$) compared with untreated (100% N without spray with value of 671 $cm^2$). The obtained results are inharmony with those obtained by **Mourad (2006), El Hedek (2013), Mousa *et al.*, (1994), Gong *et al.*, (2006) and Nasar and Abdo (2009),** who reported that spray of organic composition to the foliage led to phytohormons and natural activation compound, enhance plant vegetative growth and gave higher values and

caused significant differences among tested parameters as compared to applied mineral fertilizer.

**Table (2): Response of plant height (cm), stem diameter (cm) and days to 50 % flowering of sorghum to Ascorbic acid and potassium silicate in 2019 ($S_1$) and 2020 ($S_2$) summer seasons.**

| Trait | Plant height (cm) | | | Stem diameter (cm) | | | Day to 50% flower | | |
|---|---|---|---|---|---|---|---|---|---|
| Treatment | 2019 | 2020 | $\bar{X}$ | 2019 | 2020 | $\bar{X}$ | 2019 | 2020 | $\bar{X}$ |
| 25 % N/fed | 105 | 101 | 103 | 8.90 | 9.20 | 9.05 | 65.30 | 65.30 | 65.30 |
| 25 N/fed + Ascorbic Acid | 122 | 130 | 126 | 9.10 | 10.20 | 9.65 | 65.00 | 64.70 | 64.90 |
| 25 % N/fed + potassium silicate | 128 | 135 | 132 | 10.30 | 10.60 | 10.45 | 64.00 | 64.00 | 64.00 |
| Mean | 118 | 122 | 120 | 9.40 | 10.00 | 9.70 | 64.80 | 64.70 | 64.73 |
| 50 % N/fed | 115 | 123 | 119 | 9.60 | 9.80 | 9.70 | 69.30 | 68.30 | 68.80 |
| 50 N/fed + Ascorbic Acid | 124 | 131 | 128 | 9.90 | 10.30 | 10.10 | 68.00 | 67.70 | 67.85 |
| 50 % N/fed + potassium silicate | 129 | 138 | 134 | 10.50 | 10.80 | 10.65 | 67.00 | 66.30 | 66.65 |
| Mean | 123 | 131 | 127 | 10.00 | 10.30 | 10.15 | 68.10 | 67.40 | 67.77 |
| 75 % N/fed | 126 | 130 | 128 | 10.90 | 11.20 | 11.05 | 67.00 | 66.70 | 66.85 |
| 75 N/fed + Ascorbic Acid | 137 | 141 | 139 | 11.10 | 11.50 | 11.30 | 66.30 | 65.70 | 66.00 |
| 75 % N/fed + potassium silicate | 143 | 147 | 145 | 11.60 | 11.80 | 11.70 | 66.00 | 65.70 | 65.85 |
| Mean | 135 | 139 | 137 | 11.20 | 11.50 | 11.35 | 66.40 | 66.00 | 66.23 |
| 100 % N/fed(120 kg N/fed) control | 138 | 141 | 140 | 11.20 | 11.80 | 11.50 | 70.30 | 68.30 | 69.30 |
| 100 N/fed + Ascorbic Acid | 145 | 152 | 149 | 11.90 | 12.30 | 12.10 | 71.30 | 71.00 | 71.15 |
| 100% N/fed + potassium silicate | 149 | 156 | 153 | 12.20 | 12.40 | 12.30 | 71.30 | 69.70 | 70.50 |
| Mean | 144 | 150 | 147 | 11.80 | 12.20 | 12.00 | 71.00 | 69.67 | 70.32 |
| L. C. D. 0.05 % | 3.7 | 3.9 | - | 0.10 | 0.11 | - | 2.12 | 2.47 | - |

**Table (3): Response of no. of green leaves/plant and leaf area/plant ($cm^2$) of sorghum to Ascorbic acid and potassium silicate in 2019 ($S_1$) and 2020 ($S_2$) summer seasons.**

| Trait | No. of green leaves/plant | | | Leaf area/plant ($cm^2$) | | |
|---|---|---|---|---|---|---|
| Treatment | 2019 | 2020 | $\bar{X}$ | 2019 | 2020 | $\bar{X}$ |
| 25 % N/fed | 4.20 | 4.30 | 4.25 | 381 | 385 | 383 |
| 25 N/fed + Ascorbic Acid | 4.90 | 5.30 | 5.10 | 475 | 511 | 493 |
| 25 % N/fed + potassium silicate | 5.10 | 5.40 | 5.25 | 578 | 622 | 600 |
| Mean | 4.70 | 5.00 | 4.85 | 478 | 506 | 492 |
| 50 % N/fed | 4.90 | 5.10 | 5.00 | 593 | 613 | 603 |
| 50 N/fed + Ascorbic Acid | 5.40 | 5.60 | 5.50 | 617 | 634 | 616 |
| 50 % N/fed + potassium silicate | 5.60 | 5.70 | 5.65 | 625 | 641 | 633 |
| Mean | 5.30 | 5.50 | 5.38 | 612 | 629 | 617 |
| 75 % N/fed | 5.90 | 6.10 | 6.00 | 609 | 624 | 617 |
| 75 N/fed + Ascorbic Acid | 6.30 | 6.80 | 6.55 | 643 | 664 | 654 |
| 75 % N/fed + potassium silicate | 6.70 | 6.90 | 6.80 | 651 | 673 | 662 |
| Mean | 6.30 | 6.60 | 6.45 | 634 | 654 | 644 |
| 100 % N/fed control | 6.80 | 6.90 | 6.85 | 659 | 682 | 671 |
| 100 N/fed + Ascorbic Acid | 7.20 | 7.50 | 7.35 | 713 | 752 | 733 |
| 100% N/fed + potassium silicate | 7.40 | 7.60 | 7.50 | 803 | 822 | 813 |
| Mean | 7.10 | 7.30 | 7.20 | 725 | 752 | 739 |
| L. C. D. 0.05 % | 0.13 | 0.14 | - | 55.9 | 58.0 | - |

**Yield and yield components:**

Results presented in Table (4) showed that the treatments of 25, 50, 75 and 100%, N-mineral presented 25.35, 27.25, 35.35 and 38.75 and 23.20, 28.00, 31.00 and 32.55 for grain weight / head and 1000-grain weight, respectively and show pronounced effect of foliar application of ascorbic acid and potassium silicate on grain yield per head and 1000- grain weight. The obtained results clearly revealed that application of ascorbic acid and potassium silicate did support both grain yield per / head and 1000- grain weight and led to Scored significant increase (19.23% and 25.04%) for grain yield per / head with 75 kg N and (9.98% and 20.12 %) for 1000-grain weight with 100 kg N and recorded higher values compared with applied mineral fertilizer without spray. The highest values were found at the treatment which received 75% N / fed + ascorbic acid and the treatment 75% N / fed + potassium silicate, (42.15 and 44.20 gm), respectively for grain weight / head compared with 100% N without spray (38.75 m) and the corresponding values for 1000- grain weight were (35.80 and 39.10 gm), respectively compared with untreated 100% N which amounted 32.55 gm.

It is important to mention that increase in number of green leaves and leaves area per plant by organic composition could be due to stimulation effect for photosynthesis process and accumulation of dry matter in shoot and hence weight of grain / head and 1000- grain weight **(Katyal 2000; Fariha and Sadia 2014, Azraf-ul-Hag 2007 and Abd El-latif 2011).**

Results of green yield (ton per feddan) and grain yield ardab / feddan are presented in Table (5). The obtained results revealed that treatments of 25, 50, 75 and 100%, N-mineral produce (8.60, 9.60, 9.80 and 11.30) and 6.17, 8.83, 12.24 and 14.57 for green yield and grain yield, respectively, and foliar application of ascorbic acid and potassium silicate gave significant increase in yield and recorded (3.50% and 9.70%) to green yield. The highest values for green yield were obtained at the treatment which treated by 100% N + Ascorbic acid and the treatment 100% N+ potassium silicate, which gave (11.70 and 12.40 ton / fed), respectively for green yield compared with 100% without spray its value was 11.30 ton / fed and the corresponding for grain yield were 16.29 ardab / fed at the treatment 75% N + ascorbic acid and 22.55 ardab / fed at treatment 75% N + potassium silicate compared with 100% N without spray (14.57 ardab / fed) as significant increases reached (11.80 % and 54.80 %), for the two treatments, respectively. The obtained results of green and grain yield of sorghum crop are in agreement with those obtained by **Mourad *et al.*, (2005), Ma *et al.*, (2001), Savant *et al.*, (1999) and Salwa Hassanen and Abo- taleb (2020),** they reported that application of organic composition under mineral fertilizer levels did support and gave an activation and positive effect by increasing both yield production and yield components as compared to applied mineral N- fertilizer at full recommended dose.

**Table (4): Response of grain weight/head (gm) and 1000 - grain weight (gm) of sorghum to Ascorbic acid and potassium silicate in 2019 ($S_1$) and 2020 ($S_2$) summer seasons.**

| Trait | Grain weight/head (gm) | | $\bar{X}$ | 1000 grain weight (gm) | | $\bar{X}$ |
|---|---|---|---|---|---|---|
| Treatment | 2019 | 2020 | | 2019 | 2020 | |
| 25 % N/fed | 24.30 | 26.40 | 25.35 | 21.60 | 24.80 | 23.20 |
| 25 N/fed + Ascorbic Acid | 29.80 | 31.50 | 30.70 | 25.80 | 26.70 | 26.30 |
| 25 % N/fed + potassium silicate | 30.80 | 32.70 | 31.70 | 27.30 | 29.00 | 28.20 |
| Mean | 28.30 | 30.20 | 29.25 | 24.90 | 26.80 | 25.90 |
| 50 % N/fed | 25.70 | 28.80 | 27.25 | 27.40 | 28.60 | 28.00 |
| 50 N/fed + Ascorbic Acid | 30.10 | 32.80 | 31.50 | 29.70 | 31.90 | 30.80 |
| 50 % N/fed + potassium silicate | 32.90 | 33.40 | 33.20 | 33.80 | 34.70 | 34.30 |
| Mean | 29.60 | 31.70 | 30.65 | 30.30 | 31.70 | 31.00 |
| 75 % N/fed | 34.60 | 36.10 | 35.35 | 30.30 | 31.70 | 31.00 |
| 75 N/fed + Ascorbic Acid | 41.10 | 43.20 | 42.15 | 32.70 | 34.50 | 33.60 |
| 75 % N/fed + potassium silicate | 43.80 | 44.60 | 44.20 | 35.20 | 36.90 | 36.06 |
| Mean | 39.80 | 41.30 | 40.55 | 32.73 | 34.37 | 33.55 |
| 100 % N/fed control | 37.80 | 39.70 | 38.75 | 31.70 | 33.40 | 32.55 |
| 100 N/fed + Ascorbic Acid | 36.90 | 37.20 | 37.05 | 34.80 | 36.80 | 35.80 |
| 100% N/fed + potassium silicate | 38.70 | 39.20 | 38.95 | 38.50 | 39.70 | 39.10 |
| Mean | 37.80 | 38.70 | 38.25 | 35.00 | 36.63 | 35.81 |
| L. C. D. 0.05 % | 1.74 | 1.66 | - | 0.90 | 1.00 | - |

**Table (5): Response of green yield (ton/fed), grain yield (ardab/fed) of sorghum to Ascorbic acid and potassium silicate in 2019 ($S_1$) and 2020 ($S_2$) summer seasons.**

| Trait | Green yield (ton/fed) | | $\bar{X}$ | Grain yield (ardab/fed) | | $\bar{X}$ |
|---|---|---|---|---|---|---|
| Treatment | 2019 | 2020 | | 2019 | 2020 | |
| 25 % N/fed | 8.30 | 8.90 | 8.60 | 6.23 | 6.11 | 6.17 |
| 25 N/fed + Ascorbic Acid | 8.70 | 9.10 | 8.90 | 8.19 | 8.05 | 8.12 |
| 25 % N/fed + potassium silicate | 8.90 | 9.20 | 9.05 | 9.32 | 9.10 | 9.21 |
| Mean | 8.60 | 9.10 | 8.85 | 7.91 | 7.75 | 7.83 |
| 50 % N/fed | 9.50 | 9.70 | 9.60 | 9.00 | 8.65 | 8.83 |
| 50 N/fed + Ascorbic Acid | 10.10 | 10.50 | 10.30 | 10.98 | 10.56 | 10.77 |
| 50 % N/fed + potassium silicate | 10.40 | 10.80 | 10.60 | 13.25 | 12.99 | 13.12 |
| Mean | 10.00 | 10.30 | 10.15 | 11.08 | 10.73 | 10.91 |
| 75 % N/fed | 9.70 | 9.90 | 9.80 | 12.33 | 12.15 | 12.24 |
| 75 N/fed + Ascorbic Acid | 10.30 | 10.70 | 10.50 | 16.34 | 16.23 | 16.29 |
| 75 % N/fed + potassium silicate | 10.80 | 11.20 | 11.00 | 22.59 | 22.51 | 22.55 |
| Mean | 10.27 | 10.60 | 10.43 | 17.09 | 16.96 | 17.03 |
| 100 % N/fed control | 11.20 | 11.40 | 11.30 | 14.63 | 14.51 | 14.57 |
| 100 N/fed + Ascorbic Acid | 11.50 | 11.90 | 11.70 | 16.29 | 16.11 | 16.20 |
| 100% N/fed + potassium silicate | 12.10 | 12.70 | 12.40 | 9.11 | 18.90 | 14.00 |
| Mean | 11.60 | 12.00 | 11.80 | 13.34 | 16.51 | 14.92 |
| L. C. D. 0.05 % | 0.11 | 0.12 | - | 0.541 | 0.454 | - |

**Protein, phosphorus and potassium concentration in the grains of sorghum:**

Results given in Table (6) illustrated the grain quality and nutrient uptake (%) as protein, phosphorus and potassium contents. Results indicated that foliar application of ascorbic acid and potassium silicate led to higher values and scored significant increase as compared to applied mineral fertilizers at the 100% mineral N- fertilizer. The highest values for protein (%) in sorghum were (10.16 and 10.23 %) at the treatment which received 75% N + Ascorbic acid and 75% N + potassium silicate, respectively compared with untreated plants (100% N alone) its value was (9.20%). The corresponding values for Phosphorus (p) were 0.473 and 0.490%, respectively compared with 100% N alone which was (0.369%). As well as the values for potassium (K) were (0.393 and 0.436%) compared with (0.251%) for untreated 100% N without spray.

The obtained results are in agreement with **Hana *et al.*, (2001), Melo *et al.*, (2003), Ma *et al.*, (2006) and Kumbargire *et al.*, (2016)** who reported that N,P and K uptake (%) of plants of different crops scored response to applied of organic composition as well as phytohormons and plant growth promoting substances as nutrient component.

**Table (6): Response of protein (%), phosphorus (%) and potassium (%) of sorghum to Ascorbic acid and potassium silicate in 2019 ($S_1$) and 2020 ($S_2$) summer seasons.**

| Trait | Protein (%) | | | Phosphorus (%) | | | Potassium (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| Treatment | 2019 | 2020 | $\bar{X}$ | 2019 | 2020 | $\bar{X}$ | 2019 | 2020 | $\bar{X}$ |
| 25 % N/fed | 7.49 | 7.53 | 7.51 | 0.186 | 0.198 | 0.192 | 0.139 | 0.162 | 0.151 |
| 25 N/fed + Ascorbic Acid | 8.03 | 8.11 | 8.07 | 0.217 | 0.242 | 0.232 | 0.159 | 0.182 | 0.171 |
| 25 % N/fed + potassium silicate | 8.27 | 8.43 | 8.35 | 0.238 | 0.266 | 0.252 | 0.198 | 0.221 | 0.210 |
| Mean | 7.93 | 8.02 | 7.98 | 0.214 | 0.237 | 0.226 | 0.165 | 0.188 | 0.177 |
| 50 % N/fed | 7.99 | 8.01 | 8.00 | 0.275 | 0.314 | 0.295 | 0.175 | 0.213 | 0.194 |
| 50 N/fed + Ascorbic Acid | 8.69 | 8.93 | 8.81 | 0.299 | 0.327 | 0.313 | 0.224 | 0.247 | 0.236 |
| 50 % N/fed + potassium silicate | 8.83 | 9.07 | 8.95 | 0.317 | 0.358 | 0.333 | 0.247 | 0.283 | 0.265 |
| Mean | 8.50 | 8.67 | 8.59 | 0.297 | 0.333 | 0.315 | 0.215 | 0.248 | 0.232 |
| 75 % N/fed | 9.32 | 9.88 | 9.56 | 0.417 | 0.465 | 0.432 | 0.321 | 0.375 | 0.345 |
| 75 N/fed + Ascorbic Acid | 10.21 | 10.11 | 10.16 | 0.458 | 0.487 | 0.473 | 0.375 | 0.411 | 0.393 |
| 75 % N/fed + potassium silicate | 10.35 | 10.11 | 10.23 | 0.469 | 0.511 | 0.490 | 0.396 | 0.476 | 0.436 |
| Mean | 9.96 | 10.13 | 10.03 | 0.448 | 0.488 | 0.468 | 0.364 | 0.421 | 0.392 |
| 100 % N/fed control | 9.18 | 9.21 | 9.20 | 0.351 | 0.387 | 0.369 | 0.337 | 0.226 | 0.282 |
| 100 N/fed + Ascorbic Acid | 9.53 | 9.72 | 9.63 | 0.369 | 0.412 | 0.391 | 0.259 | 0.321 | 0.290 |
| 100% N/fed + potassium silicate | 9.82 | 9.94 | 9.88 | 0.398 | 0.445 | 0.422 | 0.278 | 0.347 | 0.313 |
| Mean | 9.51 | 9.62 | 9.57 | 0.373 | 0.415 | 0.394 | 0.291 | 0.298 | 0.295 |
| L. C. D. 0.05 % | 0.23 | 0.23 | - | 0.092 | 0.102 | - | 0.051 | 0.059 | - |

# CONCLUSION

The performed results clearly revealed that foliar application of ascorbic acid and potassium silicate are very important for grow sorghum under sandy soil, and to improve plant growth and increase grain yield and the nutrients content in grains. On the other hand, foliar application

reduce the using of mineral nitrogen as pronounced from the treatment 75% N- mineral + potassium silicate of organic composition.

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## تأثير التسميد العضوي و المعدني على إنتاجية وجودة الذرة الرفيعة تحت ظروف الأراضي الرملية

**سلوى عبد العزيز عبد الرحيم حسانين [1] ، حاتم حسين ابو طالب [2]**

(1) المعمل المركزى للزراعة العضوية ، مركز البحوث الزراعية، الجيزة ، جمهورية مصر العربية

(2) قسم بحوث الميكروبيولوجيا الزراعية ، معهد بحوث الاراضى والمياه والبيئية مركز البحوث الزراعية ، الجيزة ، جمهورية مصر العربية

أجريت تجربة حقلية خلال الموسم الصيفى لأعوام 2019 و 2020 فى الاراضى الرملية بمحافظة الفيوم فى جمهورية مصر العربية بهدف دراسة تأثر الذرة الرفيعة (هجين 305) بأضافة بعض المركبات العضوية رشا ( حمض الاسكوربيك وسليكات البوتاسيوم) تحت اربعة مستويات مختلفة من التسميد النيتروجينى ( 25 ، 50 ، 75 ، 100 % ) مقارنة بهذة المعدلات السمادية بدون اضافة. تم رش نباتات السورجم بحمض الاسكوربيك بمعدل 500 جزء

فى المليون وسليكات البوتاسيوم بمعدل 6 مللى / لتر على ثلاث فترات ( 21 ، 45 ، 60 يوم من الزراعة ) .

**أوضحت النتائج ان:**

ان أضافة كلا من حمض الاسكوربيك وسليكات البوتاسيوم رشا على هجين السورجم نتج عنها زيادات معنوية للصفات المدروسة مقارنة بالنباتات غير المعاملة. و حققت معاملة (التسميد المعدنى 75 % + سليكات البوتاسيوم ) تبكيرا فى التزهير كما حققت أعلى قيم لوزن حبوب النورة ومحصول الحبوب للفدان، حيث سجلت 22.55 اردب / فدان وكذلك سجلت أعلى القيم لمحتوى الحبوب من العناصر 10.38 ، 0.490 ، 0.436 % للبروتين والفوسفور والبوتاسيوم، على الترتيب مقارنة بالمعاملة (100 % تسميد معدنى بدون اضافة ). هذا وقد أعطت المعاملة ( 100 % تسميد معدني + سيليكات بوتاسيوم ) أعلى القيم لطول النبات وقطر الساق وعدد الأيام حتى 50 % تزهير وعدد ومساحة الأوراق ووزن الإلف حبة وكذلك المحصول الخضري للفدان ( 12.40 طن / فدان ) مقارنة بالمعاملة ( 100 % تسميد معدني بدون إضافة ) .

تشير نتائج هذة الدراسة الى انه يمكن زراعة الذرة الرفيعة تحت ظروف الاراضى الرملية وزيادة انتاجية محصول الحبوب للفدان ومحتوى الحبوب من العناصر الهامة للنبات مع تقليل التلوث البيئي بتقليل السماد المعدنى المستخدم بنسبة 25 % واستبداله بالمركب العضوى (سليكات البوتاسيوم) .