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Effect of different potassium fertilizers on yield and quality of tomato (*Solanum lycopersicum* L.) under drought stress conditions

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Abstract
The experiment was carried out in open field conditions in Ciğir village, located in the Idil district of Sirnak province, during 2020 tomato growing season. The aim of the study was to investigate the effect of different potassium (potassium chloride, potassium sulfate and potassium nitrate) fertilizers on yield and quality characteristics of tomato plants (Fereng genotype and Kamenta F1 variety) grown under drought stress. The fertilizers were foliar applied at a dose of 1%. Irrigation treatments of the experiment were full irrigation (control, 100%), 66% of the full irrigation, and 33% of the full irrigation. Leaf temperature, relative water content of leaf, chlorophyll content, fresh and dry weight of green parts, membranes injury index, soluble solid content (SSC) in tomato juice, pH of tomato juice and total yield were determined. The results indicated that drought stress had a significant adverse impacts on yield and quality of both Fereng genotype and Kamenta F1 variety. The application of potassium nitrate and potassium sulfate caused an increase in the chlorophyll and water soluble solid content. Potassium chloride application resulted in a reduction in membrane damage. The effects of potassium sulfate fertilizer on yield was significantly higher than the other two potassium fertilizers.
Keywords: Drought stress, *Solanum lycopersicum*, Yield, Potassium

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INTRODUCTION

The tomato is considered a highly valued vegetable in both domestic and international markets. The tomato, used both fresh and processed, is widely cultivated and is among the most commonly produced vegetables, following the potato (Aydoner Coban et al., 2020; Agarwal et al., 2020). Turkiye is among the most important tomato producer countries of the world (Bayramoğlu et al., 2009). Based on statistics provided by the Food and Agriculture Organization (FAO) in 2020, the total tomato production in Turkiye was about 13.204.010 tons (FAO, 2020). Turkiye holds a significant role in the cultivation of processing tomatoes (Türk et al., 2019). The vegetable in question has the potential to be utilized in both its fresh and processed forms (Ertürk and Çirka, 2015). In the human health, tomatoes and tomato products provide significant protection against wide range of important significant diseases (Salehi et al., 2019). Tomatoes is known for its abundant mineral content, in addition to carbohydrates, proteins, vitamins, and antioxidants (Perveen et al., 2015; Melfi et al., 2018; Wang et al., 2022). Lycopene, a pigments present in tomatoes, has demonstrated efficacy in the prevention of chronic diseases (Przybylska, 2020). The occurrence of drought stress has a substantial impact on both the crop yield and quality. Drought poses a significant challenge to the sustainability of global agricultural production (Akhoundnejad and Dasgan, 2020). The vegetable production is adversely affected by the increase of biotic and abiotic stressors, as well as the growing population, which has been exacerbated by climate change (Khalid et al., 2022). Water is an essential component for the production of vegetables of adequate quality (Ors et al., 2021). Drought is a significant adverse consequence of climate change that is poised to emerge as a critical concern for both our nation and the global community in the foreseeable future (Akhoundnejad et al., 2021). The drought stress reduces chlorophyll content, relative water content of leaves, growth of green part growth, plant height and fruit yield in tomato plants compared to control (Sibomana et al., 2013). The study conducted on eggplant plants under drought stress conditions revealed that relative water content of leaf, leaf membrane damage, plant growth and yield in eggplant plants have been significantly affected by the drought (Semida et al., 2021). The study on onions demonstrated that drought conditions had a negative impact on various quality characteristics, including average fruit diameter and weight, fruit firmness, and yield (Wakchaure et al., 2021). The average fruit diameter, height, weight, wall thickness and fruit yield were reported lower in drought stress conditions compared to the control in various genotypes, namely Tepeköy, Yarbaşı and Fereng (Akhoundnejad, 2020). The application of potassium fertilizer at optimal levels improves the quality attributes of plants (Kanai et al., 2007). Potassium has a positive effect on various physiological processes in tomato plants, including photosynthesis, water uptake, fruit quality and quantity (Woldmerian et al., 2018). The application of potassium nitrate fertilizer to spinach plants under drought stress conditions resulted in a significant increase in root and shoot length in the spinach plants (Bukhari et al., 2021). Wasaya et al. (2021) showed that the occurrence of drought had an adverse impact on the growth and development of maize plants. However, the application of potassium sulfate fertilizer caused an increase in the levels of chlorophyll content and relative water content of maize leaves. The application of foliar K_2SO_4 fertilizer to green pepper plants yielded positive results in fruit, stem and leaf characteristics (El-Mogy et al., 2019). Foliar application of potassium chloride, potassium nitrate and potassium sulfate resulted in improved fruit color, increased weight and firmness in apples (Solhjoo et al., 2017). The application of potassium sulfate fertilizer given to melon plants under drought stress conditions increased the chlorophyll level and relative water content of leaf, fruit yield and dry matter content in melon (Tuna et al., 2010). The objective of this study was to investigate the effect of different potassium fertilizers on yield and quality characteristics of tomato plants grown under drought-induced stress conditions.

MATERIALS AND METHODS

One tomato landrace (Fereng) and an processing tomato variety (Kamenta F1) were used in the study. The research was carried out in open field conditions in Idil district of Sirnak province. The study was carried out between April and August 2020. The laboratory analysis was completed in the laboratories of the Agricultural Faculty in Şırnak University. The layout of the experiment was randomized block design with 3 replications. Ten plants were used in each replicate. The seedlings were planted in 20 cm inter-row and 50 cm intra-row spacings. Fertilizers were applied from the leaves and application rate was 1% for potassium nitrate (KNO_3), potassium chloride (KCl) and potassium sulfate (K_2SO_4) from the leaves. Irrigation treatments of the experiment were full irrigation (control, 100%), 66% of the full irrigation (66%), and 33% of the full irrigation (33%). Fertilizer application was applied twice during the experiment, 30 days after planting and once every 21 days. Drought stress application was started 45 days after planting. The total amount of water given to tomato plants during the trial period was determined using the following formula. The total amount of water given is shown in Figure 1. Fertilizers were applied twice during the experiment, the first one was 30 days after planting and the second one was 21 days after the first fertilizer application. Drought stress application was started 45 days after planting. The total amount of water given to tomato plants during the trial period was determined using the following formula. The total amount of water given is shown in Figure 1.

$$IR = A^* \ E\ pan\ ^*kcp\ ^*\ P$$

In the equation; IR is the amount of water supplied (m^3); A is the size of a plot (da); E pan is the amount of evaporation (mm); kcp is the coefficient for tomato plant (0.80); P-mat is the vegetation (%); and P-cover is the ratio of plant crown width (cm) to row spacing (cm).

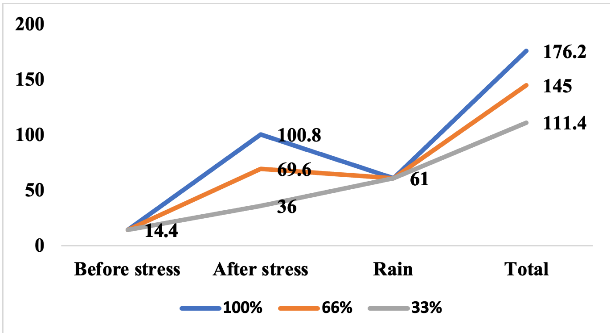

Figure 1. Total amount of water supplied (L).

(Before Stress 16.04.2020-01.06.2020, After Stress 01.06.2020-13.08.2020)

The temperature of the leaves (°C) was determined using an infrared thermometer. The procedures employed by Dlugokecka and Kacperska-Palacz (1978) and Fan and Blake (1994) were utilized to determine the membrane damage in leaf cells. The relative water content of leaves was determined by the method introduced by Türkan et al. (2005) and Sanche et al. (2003). The chlorophyll concentration in fruit juice was measured using a SPAD 502 model instrument. The pH of fruit juice was measured using a pH meter, and the Soluble Solid Content (SSC) was determined using a refractometer. All fruits harvested during the trial were recorded. The dry matter content of the green leaf sections was measured. The substance ratios were determined by weighing the fresh and dry weights of the samples.

Statistical Analysis of Data

The significance in the irrigation treatments and fertilizer types was assessed by analysis of variance (ANOVA) test. Least Significant Difference test ($P<0.05$) was used to differentiate the means in case ANOVA denoted significant differences between the irrigation treatments or fertilizer types. in the data was evaluated using the JMP 13th statistical software.

RESULTS AND DISCUSSION

The leaf temperature of tomato plants under 66% and 33% irrigation treatments was 1.93% and 1.13% higher compared to the control (Table 1), respectively. The findings of the study indicated that the utilization of KCl (5%) fertilizer in the Kamenta F1 variety, along with a 66% irrigation treatment, yielded superior results in comparison to alternative treatments. When plants experience drought stress, they respond by closing their stomata, resulting in an absence of transpiration. This lack of transpiration leads to an increase in leaf temperatures. Fanaei et al. (2009) reported an increase in leaf temperatures of canola and mustard grass in response to drought stress conditions. Ardestani and Rad (2012) conducted a study in which they observed that drought conditions in rapeseed plants resulted in an increase of leaf temperature. However, the application of potassium and potassium sulfate fertilizers to the plants was found to mitigate this increase in leaf temperature. In general, the foliage in the plant under drought stress to balance the water loss of stomata by decreasing the water rate. They close for this purpose. This causes photosynthesis to slow down, It causes the leaf temperature to increase.

The overall mean values of the applications revealed a 0.60% rise in the proportion of plants receiving 66% irrigation, while a 0.47% decline was observed in the proportion of tomato plants receiving 33% irrigation.

The effect of several potassium fertilizers on chlorophyll content is given in Table 2. The highest chlorophyll content was obtained from KNO_3 (71.73%) application in Kamenta F1 variety under 66% irrigation. Conversely the lowest chlorophyll content (50.78%) was measured in KCl application from Kamenta F1 variety under 33% irrigation. In comparison to the control group, the overall mean chlorophyll content values of the applications revealed a 0.60% increase in 66% irrigation treatments, and 0.47% decrease in 33% irrigation treatment. The ratio of changes was the in the control (15.74%) for Kamenta F1 variety under 33% irrigation (Table 2). The study conducted by Hayat et al. (2008) indicated a reduction in the chlorophyll content of tomato plants when subjected to drought stress. Aliche et al. (2020) reported that the drought in potato plants has an adverse impact on the chlorophyll content. According to Tuna et al. (2010), the presence of drought stress circumstances led to a reduction in the chlorophyll content of melon plants. However, the application of K_2SO_4 to these plants had a beneficial impact on the chlorophyll levels. The application of KNO_3 and urea to maize plants under drought and salinity stress conditions significantly increased the chlorophyll content in plants (Saed-Moocheshi et al., 2014).

The relative water content of leaves was significantly different among the irrigation treatments (Table 3). The efficiency of control (91.28%) treatment (100% water) for Fereng genotype was higher compared to all other irrigation treatments and fertilization applications. The application of 33% irrigation increased the relative water content of leaves by 1% compared to control application. The relative water content in K_2SO_4 fertilizer application

Table 1. The effect of applied different potassium fertilizers on leaf temperature.

Application	%100 Irrigation	%66 Irrigation	%33 Irrigation	66% change compared to control in irrigation (%)	33% change compared to control in irrigation (%)
Kamenta+Control	27.70 bc	29.70 ac	30.10 a	7.22	8.66
Fereng+Control	27.60 bc	27.80 d	27.25 d	0.72	-1.27
Kamenta+KCl	30.15 ab	28.40 cd	29.95 ab	-5.80	-0.66
Fereng+KCl	30.70 a	31.00 a	30.95 a	0.98	0.81
Kamenta+K_2SO_4	30.75 a	30.70 a	30.90 a	-0.16	0.49
Fereng+K_2SO_4	27.05 c	28.40 cd	27.30 cd	4.99	0.92
Kamenta+KNO_3	29.60 ac	30.10 ab	28.65 bc	1.69	-3.21
Fereng+KNO_3	27.30 ac	28.90 bd	28.20 cd	5.86	3.30
Mean	28.85	29.37	29.16	1.93	1.13
LSD	2.99	1.57	1.37	-	-
P	0.0581	0.0046*	<.0001*	-	-

Table 2. Effect of applied different potassium fertilizers on chlorophyll content.

Application	%100 Irrigation	%66 Irrigation	%33 Irrigation	66% change compared to control in irrigation (%)	33% change compared to control in irrigation (%)
Kamenta+Control	63.27 b	65.78 b	53.31 d	3.97	-15.74
Fereng+Control	59.84 d	55.66 cd	57.36 c	-6.99	-4.14
Kamenta+KCl	53.68 e	53.03 de	50.78 e	-1.21	-5.40
Fereng+KCl	60.88 cd	69.40 a	64.98 b	13.99	6.73
Kamenta+K_2SO_4	53.18 e	50.34 e	63. 88 b	-5.34	20.12
Fereng+K_2SO_4	69.87 a	63.89 b	64.54 b	-8.56	-7.63
Kamenta+KNO_3	62.74 b	71.73 a	56.27 c	14.33	-10.31
Fereng+KNO_3	61.07 c	57.82 c	68.77 a	-5.32	12.61
Mean	60.56	60.95	59.98	0.60	-0.47
LSD	1.03	3.29	1.18	-	-
P	<.0001*	<.0001*	<.0001*	-	-

Table 3. The effect of applied different potassium fertilizers on the relative water content of leaves.

Application	%100 Irrigation	%66 Irrigation	%33 Irrigation	66% change compared to control in irrigation (%)	33% change compared to control in irrigation (%)
Kamenta+Control	74.54 e	75.76 bc	75.31 d	1.64	1.03
Fereng+Control	91.28 a	78.27 a	78.49 c	-14.25	-14.01
Kamenta+KCl	73.24 f	75.50 bc	73.21 e	3.09	-0.04
Fereng+KCl	83.89 b	75.38 bc	75.28 d	-10.14	-10.26
Kamenta+K_2SO_4	69.26 h	76.55 b	81.77 b	10.53	18.06
Fereng+K_2SO_4	79.31 c	76.57 b	78.46 c	-3.45	-1.07
Kamenta+KNO_3	72.35 g	74.59 c	77.09 c	3.10	6.55
Fereng+KNO_3	78.26 d	75.70 bc	84.74 a	-3.27	8.28
Mean	77.76	76.04	78.04	-1.59	1.07
LSD	0.60	1.20	1.47	-	-
P	<.0001*	0.0007*	<.0001*	-	-

Table 4. The effect of applied different potassium fertilizers on membrane damage in leaf cells.

Application	%66 Irrigation	%33 Irrigation
Kamenta+Control	24.48 c	25.49 b
Fereng+Control	25.89 b	28.84 a
Kamenta+KCl	25.98 b	24.45 c
Fereng+KCl	28.56 a	25.46 b
Kamenta+K_2SO_4	26.23 b	28.74 a
Fereng+K_2SO_4	26.60 b	25.19 bc
Kamenta+KNO_3	26.05 b	25.40 b
Fereng+KNO_3	26.67 b	28.33 a
Mean	26.30	26.48
LSD	0.96	0.78
P	<.0001*	<.0001*

for Kamenta F1 variety under 66% and 33% irrigation was 10% and 18% higher compared to the control (Table 3), respectively. The results revealed that application of different potassium fertilizers under drought stress improve the relative water content of tomato plant leaves. According to Soleimanzadeh et al. (2010), drought conditions reduce the relative water content of leaves. Kirnak et al. (2002) investigated the effects of drought stress on eggplant and indicated that drought stress resulted in a reduction in the relative water content of the plant leaves. Likewise, Zhou et al. (2017) showed that the relative water content of tomato plant leaves was drastically reduced under drought stress conditions. Drought stress in citrus seedlings decreased the relative

Table 5. The effect of applied different potassium fertilizers on soluble solid content (SSC) in fruit juice.

Application	%100 Irrigation	%66 Irrigation	%33 Irrigation	66% change compared to control in irrigation (%)	33% change compared to control in irrigation (%)
Kamenta+Control	4.75 bc	6.05 ab	6.51 b	27.37	37.05
Fereng+Control	5.05 ab	5.50 c	7.00 a	8.91	38.61
Kamenta+KCl	4.96 ac	5.60 bc	6.97 a	12.90	40.52
Fereng+KCl	4.97 ac	5.95 ac	7.00 a	19.72	40.85
Kamenta+K_2SO_4	4.64 c	5.90 ac	7.10 a	27.16	53.02
Fereng+K_2SO_4	4.97 ac	6.40 a	7.00 a	28.77	40.85
Kamenta+KNO_3	4.95 ac	5.95 ac	6.96 a	20.20	40.61
Fereng+KNO_3	5.28 a	5.50 c	7.10 a	4.17	34.47
Mean	4.94	5.85	6.95	18.64	40.74
LSD	0.35	0.53	0.32	-	-
P	0.1932	0.0367*	0.0384*	-	-

Table 6. The effect of different potassium fertilizers applied on the pH content of fruit juice.

Application	%100 Irrigation	%66 Irrigation	%33 Irrigation	66% change compared to control in irrigation (%)	33% change compared to control in irrigation (%)
Kamenta+Control	4.51 ab	4.65 a	4.34 cd	3.10	-3.77
Fereng+Control	4.56 ab	4.57 ab	4.37 bd	0.22	-4.17
Kamenta+KCl	4.54 ab	4.62 a	4.33 d	1.76	-4.63
Fereng+KCl	4.64 a	4.56 ab	4.43 ad	-1.72	-4.53
Kamenta+K_2SO_4	4.59 a	4.58 ab	4.50 ab	-0.22	-1.96
Fereng+K_2SO_4	4.49 ab	4.50 b	4.50 ac	0.22	0.22
Kamenta+KNO_3	4.36 b	4.31 c	4.54 a	-1.15	4.13
Fereng+KNO_3	4.62 a	4.62 a	4.51 ab	0.00	-2.38
Mean	4.53	4.55	4.44	0.30	-2.13
LSD	0.22	0.11	0.16	-	-
P	0.2460	0.0004*	0.0674	-	-

Table 7. The effect of different potassium fertilizers applied on the fresh and dry weight of tomato plants in green parts.

Application	%100 Irrigation	%66 Irrigation	%33 Irrigation	66% change compared to control in irrigation (%)	33% change compared to control in irrigation (%)
Kamenta+Control	18.76 b	20.31 ab	18.82 bc	8.26	0.32
Fereng+Control	18.31 b	18.05 d	20.72 a	-1.42	13.16
Kamenta+KCl	20.57 a	20.68 a	16.78 d	0.53	-18.42
Fereng+KCl	14.53 c	20.88 a	8.36 e	43.70	-42.46
Kamenta+K_2SO_4	18.62 b	19.60 ab	19.60 b	5.26	5.26
Fereng+K_2SO_4	19.36 ab	19.35 bc	18.15 d	-0.05	-6.25
Kamenta+KNO_3	18.75 b	16.14 e	18.88 bc	-13.92	0.69
Fereng+KNO_3	14.38 c	18.12 cd	18.85 bc	26.01	31.08
Mean	17.91	19.14	17.52	8.54	-2.07
LSD	1.35	1.29	0.98	-	-
P	<.0001*	<.0001*	<.0001*	-	-

water content of the leaves. However, the application of KNO_3 on the seedlings alleviated the drought impact and increased the relative water content of leaves (Gimeno et al., 2014).

There was no statistically significant difference observed in membrane damage in leaf cells between the various fertilizer applications under 66% irrigation, with the exception of the control application of the

Table 8. The effect of different potassium fertilizers applied on total yield.

Application	%100 Irrigation	%66 Irrigation	%33 Irrigation	66% change compared to control in irrigation (%)	33% change compared to control in irrigation (%)
Kamenta+Control	804.39 c	801.10 c	538.97 bc	-0.41	-33.00
Fereng+Control	410.90 e	450.13 e	347.00 e	9.55	-15.55
Kamenta+KCl	975.72 ab	679.59 d	605.73 b	-30.35	-37.92
Fereng+KCl	816.72 bc	767.03 cd	409.50 de	-6.08	-49.86
Kamenta+K_2SO_4	1100.83 a	1332.76 a	831.70 a	21.07	-24.45
Fereng+K_2SO_4	710.12 cd	829.88 c	471.66 cd	16.86	-33.58
Kamenta+KNO_3	1065.20 a	992.40 b	802.16 a	-6.83	-24.69
Fereng+KNO_3	636.05 cd	460.15 e	483.33 cd	-27.66	-24.01
Mean	814.99	789.13	561.25	-2.98	-30.38
LSD	158.16	105.03	121.38	-	-
P	<.0001*	<.0001*	<.0001*	-	-

Fereng genotype and Kamenta F1 variety (Table 4). The Kamenta F1 cultivar had the highest resistance (24.45%) among the several applications tested, particularly at 33% irrigation. The control group exhibited the highest level of membrane damage, with a recorded percentage of 28.84%. This was observed in the application of the Fereng genotype under 33% irrigation circumstances. Yıldızlı et al. (2018) shown that drought stress in pepper plants led to an increase in membrane damage within leaf cells. A positive correlation was recorded between the intensity of drought stress and the percentage of membrane damage in maize plants (Li-Ping et al., 2006). Zain and Ismail (2016) indicated that the application of drought stress on rice plants leads to an increased rate of membrane damage. According to Dasgan et al. (2015) the Leaf membrane damage of melon plants increased due to the abiotic conditions such as drought and salinity. However, the use of K_2SO_4 and KCl fertilizers mitigated the adverse impacts on the damage index.

The ratios of water-soluble dry matter under 100%, 66%, and 33% irrigation treatments were found to be similar. The Kamenta F1 variety exhibited the highest ratio of water soluble dry matter when treated with K_2SO_4 (7.10%) while the Fereng genotype showed the same result when treated with KNO_3 (7.10%), both under conditions of 33% irrigation. No statistically significant differences were observed among 33% irrigation treatment, except for the control application of the Kamenta F1 variety. The water soluble dry matter ratio indicated a significant increase of 18.64% and 40.74% under 33% and 66% irrigation levels, respectively, in comparison to the control group (Table 5). The increase in drought-induced stress resulted in a corresponding increase in the concentration of soluble dry matter content. According to Karam et al. (2011) an increase in the drought stress level was found to be associated with an increase in the SSC in eggplant plants. Mardanluo et al. (2018) found that the application of potassium fertilizer to chili and bell pepper plants resulted in an increase in the concentration of SSC in the fruit juice. According to Woldmeriam et al. (2018) the application of potassium fertilizer resulted in an increase in SSC of tomato juice. Wakchaure et al. (2020) showed that the application of KNO_3 and urea fertilizer during drought stress periods demonstrated the efficacy in increasing SSC in eggplant plants.

Table 6 presents the impact of several foliar potassium fertilizers on the pH levels of apple juice. Based on the obtained data, the pH levels in the various fruit juices were similar to one another (Table 6). In comparison to the control group, the experimental group demonstrated the most significant rise in pH level change under the 33% irrigation, specifically with the Kamenta F1 variety treated with KNO_3, resulting in a 4.13% increase. Conversely, the Kamenta F1 variety treated with KCl exhibited a 4.63% reduction under the similar irrigation conditions If the pH decreases, the amount of dry matter in the fruit increases, which improves the taste of the fruit. Agbemafle et al. (2014) demonstrated that the application of drought stress resulted in a significant reduction in the pH levels of tomato fruit juice. Similarly, Renquist and Reid (2001) and Coban et al. (2020) discovered that drought and salt stress conditions resulted in a reduction in the pH levels of tomato plant juice.

The use of potassium chloride (KCl) on the Kamenta F1 tomato variety with 66% irrigation led to a notable 20.68% increase in the wet and dry weight of the green components of the plants. Conversely, the application of KCl (with a ratio of increase of 8.36%) on the Fereng genotype in 33% irrigation did not yield any significant impact (Table 7). The results indicated that the mean wet and dry weight in 66% irrigation had a significant increase (8.54%) compared to the control group. Conversely, the plants subjected to 33% irrigation exhibited a decrease of 2.07% in the mean wet and dry weight. The change in wet and dry weight under different irrigation treatments relative to the control group indicated that the variability of changes was higher in the 33% irrigation treatment compared to the 66% irrigation treatment (Table 7). Zhou et al. (2017) reported that abiotic stress such as heat and drought have a negative impact on the fresh and dry weights in green parts tomato plants. In this study, we can obtain better quality products at lower costs and under drought stress conditions. Additionally, in the future, we can test different elements in drought areas and see their performance on tomato fruits.

The highest overall yield characteristics were obtained through the use of the Kamenta F1 variety with K_2SO_4 fertilizer, resulting in a yield of 1332.76 grams per plant under 66% irrigation. Additionally, the Kamenta F1 variety with K_2SO_4 fertilizer yielded 1100.83 grams per plant at 100% irrigation. The yield (347.00 plant g^{-1}) of Fereng genotype in control under 33% irrigation was not significantly different (Table 8). In the control, the yield was significantly decreased under both 66% and 33% stress treatments. The corresponding decrease were found to be 2.98% and 30.38% for the respective treatments. The yield in 33% and 66% irrigation applications significantly decreased in all treatments, except for the Fereng genotype in control, Kamenta F1 in K_2SO_4 fertilizer, and Fereng genotype in K_2SO_4 fertilizer application under the 66% irrigation treatment (Table 8). The findings indicated a negative correlation between the intensity of drought stress and overall yield, with an observed decrease in yield as the level of stress intensified. The application of potassium sulfate fertilizer has been found to have an impact on the overall crop yield. Klunklin and Savage (2017) emphasized the significance of irrigation for obtaining optimal yields in tomato plants. According to Agbna et al. (2017) the yield of tomato fruit is negatively affected by drought-induced stress. Neseim et al. (2014) demonstrated that the production of sugar beet was adversely affected by drought stress, but the application of K_2SO_4 fertilizer proved to be efficacious to increase fruit yield. According to a study conducted by Asgharipour and Heidari (2011) the application of K_2SO_4 to sorghum plants experiencing drought stress resulted in a notable increase in fruit yield when compared to the control group.

CONCLUSION

The occurrence of drought stress resulted in an increase in leaf temperature. The use of KNO_3 and K_2SO_4 fertilizers, under 33% and 66% deficit irrigation treatments resulted in a significant increase in chlorophyll and water soluble dry matter content. The findings indicated that the application of K_2SO_4 fertilizer resulted in the highest tomato fruit yield. The use of KCl fertilizer resulted in a reduction in membrane damage observed in leaf cells. The findings of this study indicate that the application of all three fertilizers had a beneficial impact on the measured parameters in both the Kamenta F1 tomato cultivar and the Fereng tomato genotype under drought stress conditions.

COMPLIANCE WITH ETHICAL STANDARDS

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Externally peer-reviewed.

Conflict of interest

There is no conflict of interest between the authors.

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The authors contributed equally to the article.

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