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The effect of combinations of growth regulators on dry matter distribution efficiency and its relationship to physiological growth traits for genotypes of *Sorghum bicolor* (L. Moench)

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ABSTRACT
A field experiment was carried out during the seasons 2021-2022 and 2022-2023 AD in the experimental field belonging to the Department of Field Crops at the College of Agriculture at Tikrit University. It included six combinations of kinetin and ascorbic acid (0, 20, 60, 20+60, 20+30, and 10+ 60) mg. liter^{-1}, and two spraying stages, four leaves and after the first mowing, and five varieties of sorghum (Rabeh, J, Li, Ghisa and Anqad). The experiment was applied according to a completely randomized block design and in a split-plot arrangement twice. The results showed the following:
The Giza variety excels in the characteristics of plant height in cm and the number of branches. Plant^{-1} number of green leaves. plants.
The concentration exceeds 60 mg. Liters^{-1}, the height of the plant and the number of branches in the plant. Plant and leaf chlorophyll content The first group excelled in all the characteristics studied.

تأثير توليفات من منظمات النمو في كفاءة توزيع المادة الجافة وعلاقتها بصفات النمو الفسلجية لتراكيب وراثية من الذرة البيضاء ***Sorghum bicolor*** **(L. Moench)**

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الخلاصة
نفذت تجربة حقلية خلال الموسم الصيفي للعامين ٢٠٢١-٢٠٢٢ و٢٠٢٢ -٢٠٢٣ م فـي حقل التجارب العائد لقسم المحاصيل الحقلية ـ كلية الزراعة ـ جامعة تكريت, طبقت التجربة وفق تصميم القطاعات العشوائية الكاملة وبترتيب الالواح المنشقة مرتين وتضمنت ثلاثة عوامل الاول ستة توليفات من الكاينتين وحامض الاسكوربك و هي (٠ و ٢٠ و ٦٠ و٢٠+٦٠ و٢٠+٣٠ و١٠+٦٠)ملغم . لتر$^{-1}$ والثاني خمسة أصناف من الذرة البيضاء (رابح و J و Li و جيزة وانقاذ) وتحت الثانوي الحشتين ,

اظهرت النتائج ما يلي: تفوق الصنف جيزة في صفات ارتفاع النبات (سم.نبات$^{-1}$) وعدد الافرع (فرع. نبات$^{-1}$) عدد الاوراق الخضراء (ورقة. نبات$^{-1}$). تفوقت المعاملة B_3 ٦٠ملغم. لتر$^{-1}$ في ارتفاع النبات (سم. نبات$^{-1}$) وعدد الافرع في النبات (فرع. نبات$^{-1}$) ومحتوى الاوراق من الكلوروفيل (سباد).

كلمات مفتاحية: حامض السكوربيك، الاصناف، المادة الجافة.

INTRODUCTION

Sorghum bicolor is grown mainly for fodder use by animals, and the process of producing green fodder from it is still on a limited scale in the country despite the environmental conditions being suitable for the success of its cultivation. The problem of the lack of green fodder during the summer months in Iraq requires searching for agricultural varieties and methods that To increase the yield of green fodder, which has a desirable nutritional value. Due to the high resistance of this crop to harsh conditions such as high temperature, salinity, and drought, it is called camel crop, in addition to its rapid growth, especially after mowing, its abundant production of grains and good fodder, and its ability to grow several times after mowing (El-Naim et al., 2012).

The technique of using plant growth regulators is one of the common methods in modern agriculture because it is used in very low concentrations. It encourages the plant to exploit nutrients with high efficiency and is active while regulating various physiological processes. It has an effective role in increasing the dry matter yield in plants and has an effect similar to the natural hormones that plants produce by stimulating carbon metabolism and dry matter production.

Ascorbic acid, or vitamin C, is a water-soluble organic compound. It is synthesized in plants through quinic acid, which is found in chloroplasts. Ascorbic acid is one of the important growth regulators that positively affects the growth of plants because it is an antioxidant and works to remove Toxins from plants and helps encourage the construction of proteins by stimulating an increase in the plant's RNA content Vitamin C acts as a regulator and stimulant for the flowering process, carbon metabolism, and the growth and development of the vegetative and root systems.

Abdel Hamid (2016) explained that the Giza variety gave the highest average of plant high 164.66 and 185.23 cm for the spring and two seasons, respectively, and that the lowest average height was for plants of the E22 variety, as the average reached 85.33 and 100.33 cm for the spring and two seasons, respectively.

Ahmed and Abboud (2016) found that when planting two varieties of Sorghum (Buhouth Seventy and Rabeh), for two seasons, the variety Rabih was superior, which recorded the highest average leaf area of 4356 cm², while the variety Bohouth Seventy recorded an average of 3215 cm² for the two season.

Pospicil et al. (2019) observed superior plant height and leaf area traits when treating sorghum varieties with kinetin.

Ahmad et al. (2014) showed that adding ASC acid at concentrations of 20 and 40 mg. L^{-1} gave a leaf area of 176.00 and 178.67 cm2 compared to the treatment of not adding (0) 140.67 cm^2.

Torrecillas and others (2021) confirmed that adding different concentrations of ascorbic acid to varieties of sorghum led to superiority in the characteristics of leaf smears and chlorophyll content in the leaves.

MATERIALS AND METHODS

A field experiment was conducted in the summer season of 2021-2022 and 2022-2023 AD in the field experiments field belonging to the Field Crops Department - College of Agriculture - Tikrit University. The land was divided according to the experiment plan and included experimental units distributed in three replicates, 18 experimental units per replicate. The land was plowed. The experiment involved two perpendicular plows using a disc plow, then leveling and smoothing operations were carried out in order to create a suitable bed for the seeds.

I fertilized the field soil by adding 200 kg. ha^{-1} Nitrogen fertilizer in the form of urea 46% and 120 kg. ha^{-1} Phosphate fertilizer in the form of triple superphosphate P_{2O5} (Sabahi, 2011). Phosphate fertilizer was added mixed with the soil in one batch, and nitrogen fertilizer was added in two batches. Half the quantity was added at planting and the other half a month after planting. Seeds of five varieties of Sorghum were planted in Two years in lines, and the distance between one line and another was (50) cm and between one plant and another (50) cm, and the number of plants in one line was 12 plants, thus the number of plants in the experimental unit became 18 plants. three seeds were placed in the seedling at a depth of 2-3 cm, then the experiment was irrigated using a drip irrigation system. After the seedlings emerged, the process of patching the absent seedlings was carried out, after which the seedlings were thinned out to leave one plant for each seedling. The combinations of acid and kinetin were sprayed at the four-leaf stage according to the concentrations used in the experiment. A 16-litre manual sprayer was used to carry out the spraying process, which was sprayed early in the morning until the plants were completely wet. The experimental units were watered well one or two days before spraying to increase the efficiency. Plants absorbed the spray material, and the control treatment was sprayed with distilled water only. Plant height(cm), Number of branches in the plant (branch.$plant^{-1}$), Number of green leaves (leaf. $plant^{-1}$), Chlorophyll (SPAD) content of leaves, Leaf area (cm^2.plant)

The experiment was applied in the field according to a completely randomized block design (R.C.B.D), a split plot system twice. Spraying concentrations of kinetin and ascorbic acid were distributed in the main plots to control the spraying process, and the varieties were distributed in the secondary plots. As for the applications, they were carried out in the sub-secondary plots, where the levels of the studied factors were as follows: The first factor : - Different concentrations of kinetin and ascorbic acid (0, 20, 60, 20+60, 20+30, and 10+60) mg. $Liter^{-1}$. The second factor: - Items. The third factor: - varieties.

After determining the location of the experiment, soil samples were taken from it at a depth of (0-30) cm before planting and were analyzed to reveal the physical and chemical (table 1) shown in Table No. (1).

Table: No1 Some physical and chemical characteristics of the experimental soil before planting

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Adjective	Measurement	Measurement units
soil reaction degree (pH)	**7.20**	/
Electrical conductivity (EC)	**2.33**	$DS.m^{-1}$
Organic Matter (OM)	**0.8**	$g.kg^{-1}$ soil
(N)available nitrogen	**17.5**	$Mg.kg^{-1}$soil
Phosphorous (P)available	**5.19**	
Potassium (K)available	**71.27**	
Soil texture	Sandy loam	

RESULTS AND DISCUSSION

The results of the analysis of variance in Table (1) indicate that there is a significant effect on the characteristics of the chlorophyll content of leaves, while the characteristics of plant height, number of branches, number of green leaves, and leaf area did not reach the limits of statistical significance. The treatments also had a highly significant effect on all traits except for plant height, which was significant. As for the effect of varieties, the traits of plant height, number of green leaves, chlorophyll content of leaves, and leaf area were highly significant, while the traits of number of branches were non-significant, and the effect of the interaction between the treatments The varieties were highly significant for the characteristics of leaf content of chlorophyll and leaf area.

Table: 2 Analysis of variance represented by sources of variation and mean squares (MS) of classes and combinations for all studied traits.

S.O.V	d.f	M.S.				
		to rise the plant (cm.plant^{-1})	number Branches (branch Plant^{-1})	number Papers Green (paper. Plant^{-1})	Chlorophyll (spad) content of leaves	Leaf area (cm^2. plant^{-1})
Duplicates	2	37.318	2.918	1.619	165.963	239256.365
A	1	542.882 n.s	0.045 n.s	1.390 n.s	269.622*	109619.676 n.s
R(A)	2	35.999	0.365	0.4243	6.354	18058.373
B	5	489.673*	2.057**	17.918 **	350.890**	1028624.536**
AB	5	11.476 n.s	0.408 n.s	0.571 n.s	8.475 n.s	28868.109*
R*B(A)	20	130.546	0.420	0.474	6.102	12347.357
C	4	2354.665 n.s	0.597 n.s	3.082**	1795.608**	897238.143**
AC	4	9.338 n.s	0.344 n.s	0.397 n.s	8.408n.s	8038.907n.s
BC	20	74.704 n.s	0.400 n.s	0.745*	18.023**	32839.256**
ABC	20	8.283 n.s	0.364 n.s	0.385 n.s	5.231 n.s	9072.166n.s
Error	96	59.38701	0.36883472	0.4246489	6.49899	12072.09
Total	179	22623.12198	81.81743278	184.7337311	10838.20803	11776917.18

The results of the analysis of variance in Appendix (2) indicate that there is a highly significant effect of the first mowing on the characteristics of green fodder yield, percentage of dry matter, percentage of crude protein in leaves, percentage of crude protein in stem, crude protein yield in leaves, percentage of crude fiber in stem, and crude fiber yield. In the leaves, the characteristics of the chlorophyll content of the leaves, the crude protein yield in the stem, and the percentage of ash were significant, while the characteristics of plant height, number of branches, number of green leaves, leaf-to-stem ratio, leaf area, crop growth rate, dry matter yield, percentage of crude fiber in the leaves, and crude fiber yield in the stem were not significant. Leg limits of statistical significance. The treatments had a highly significant effect on all traits except for plant height, which was significant, while the leaf-to-stem ratio did not reach the limits of significance. As for the effect of varieties, the traits were plant height, number of green leaves, chlorophyll content of leaves, leaf area, crop growth rate, green fodder yield, and green fodder yield. Dry matter, percentage of dry matter, percentage of crude protein in leaves and stem, crude protein yield in stem and leaves, percentage of crude fiber in stem, crude fiber yield in stem and leaves, and percentage of ash were highly significant, while the characteristics of number of branches, ratio of leaves to stem, and percentage of crude fiber in The leaf are not moral

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Table 3: Effect of treatments, varieties, weeds, and their two- and three-way interactions on plant height (cm. Plant^{-1}).

Items	Triple interaction between units, transactions, and classes										Interaction between entries and transactions		Average female workers
	The first filling					The second filling							
Transactions	**C1**	**C2**	**C3**	**C4**	**C5**	**C1**	**C2**	**C3**	**C4**	**C5**	**A1**	**A2**	
B1	1.02 **b**	1.12 **B**	1.65 **B**	1.45b	1.51 **B**	1.01 **b**	1.08 **b**	1.34 **b**	1.34 **B**	1.31 **B**	1.03 **C**	1.01 **C**	1.02 d
B2	1.03 **b**	1.19 **B**	1.91 **B**	1.25 **b**	1.34 **B**	1.01 **b**	1.11 **b**	1.68 **b**	1.18 **B**	1.23 **B**	1.15 **Bc**	1.10 **C**	1.12 cd
B3	1.04 **b**	1.25 **B**	1.62 **B**	1.42 **b**	1.51 **b**	1.02 **b**	1.19 **b**	1.45 **b**	1.34 **B**	4.04 A	1.68 **Ab**	1.47 **a-c**	1.57 ab
B4	1.05 **b**	1.12 **B**	1.12 **B**	1.63 **b**	1.45 **b**	1.03 **b**	1.09 **b**	1.08 **b**	1.25 **B**	1.32 **B**	1.25 **Bc**	1.19 **Bc**	1.22 b-d
B5	1.03 **b**	1.53 **B**	1.20 b	1.58 **b**	1.69 **b**	1.01 **b**	1.34 **b**	1.15 **b**	1.35 **B**	1.54 **B**	1.58 **a-c**	1.33 **a-c**	1.45 a-c
B6	1.08 **b**	1.71 **B**	1.27 **B**	1.78 **b**	1.41 **b**	1.06 **b**	1.54 **b**	1.21 **b**	1.41 **B**	1.28 **B**	1.48 **a-c**	1.88 **A**	1.68 a

Items	Interaction between transactions and classes						Interaction between fillings and varieties		Average items
	B1	**B2**	**B3**	**B4**	**B5**	**B6**	**A1**	**A2**	
C1	1.01 **B**	1.07 **B**	1.43 **b**	1.10 **B**	1.38 **B**	1.28 **B**	1.25 **Ab**	1.17 **B**	1.21 a
C2	1.02 **B**	1.10 **B**	1.62 **b**	1.17 **B**	1.44 **B**	2.77 **A**	1.36 **Ab**	1.68 **A**	1.52 **a**
C3	1.03 **B**	1.15 **B**	1.49 **b**	1.24 **B**	1.46 **B**	1.38 **B**	1.36 **Ab**	1.22 **Ab**	1.29 **a**
C4	1.04 **b**	1.22 **B**	1.79 **b**	1.39 **B**	1.59 **B**	1.61 **B**	1.52 **Ab**	1.36 **Ab**	1.44 **a**
C5	1.02 **b**	1.10 **B**	1.53 **b**	1.21 **B**	1.41 **B**	1.34 **B**	1.32 **Ab**	1.22 **Ab**	1.27 **a**
Average fillings							1.36 A	1.33 A	

Means with the same letter for each trait did not significantly different.

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1. Number of branches in the plant (branch.plant^{-1}):

We review from the results of Table No. (4) the presence of significant differences between the two growing seasons, as the second season was significantly superior with an average of 1,411 branches. Plant^{-1} compared to the first season, which gave the lowest average of 1,304 branches. Plant^{-1} excelled in the second season in terms of environmental conditions, such as ideal temperatures, rainfall amounts, and more hours of sunshine. As for the parameters, the concentration (B3) excelled by giving it the highest average of 1.63 branches. Plant^{-1} with the comparison treatment (C2), which gave the lowest average of 1.29 branches. Plant^{-1} The reason for the increase in the number of branches is due to an increase in the size of the root system and thus an increase in the absorption of nutrients, including nitrogen, which encourages the growth of lateral shoots and an increase in the number of branches in the plant. As for the effect of the varieties, the results showed that there were significant differences between the trait averages, as the Giza variety excelled by giving the highest values, which amounted to 1.51 branches. Plant-1, while the variety Rabeh obtained the lowest values, reaching 1.33 branches. Plant^{-1} The reason for increasing the level of nitrogen fertilization and the extent to which the variety benefits from this increase is attributed to an increase in the size of the root system and thus an increase in the absorption of nutrients, including nitrogen, which encourages the growth of lateral shoots and an increase in the number of branches in the plant.

Given the triple interaction, the first cutting, the second treatment, and the Li cultivar excelled in giving the highest average for the trait, amounting to 1.78 branches. Plant^{-1}. Likewise, the triple interaction between the second planting, the second treatment, and the Li cultivar excelled with the highest average of 1.76 branches. Plant^{-1}.

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Table 4: Effect of treatments, varieties, cuttings, and their two- and three-way interactions. Number of branches (branch. Plant^{-1}).

Items / Transactions	Triple interaction between units, transactions, and classes										Interaction between entries and transactions		Average female workers
	The first filling					The second filling							
	C1	**C2**	**C3**	**C4**	**C5**	**C1**	**C2**	**C3**	**C4**	**C5**	**A1**	**A2**	
B1	8.08 **o-q**	9.12 **k-p**	10.72 a-d	10.42 **a-k**	10.21 **a-l**	8.06 **pq**	9.12 **k-p**	10.66 **a-e**	10.23 **a-l**	10.12 **a-l**	8.56 **E**	8.52 **e**	8.54 d
B2	9.19 **h-o**	9.14 **j-p**	11.19 **A**	9.45 **d-m**	9.86 **b-l**	9.12 **k-p**	9.11 **k-p**	11.14 **ab**	9.38 **e-o**	9.63 **c-l**	9.17 **D**	9.14 **d**	9.15 c
B3	8.14 **m-q**	9.32 **f-p**	10.52 **a-h**	10.12 **a-l**	10.12 **a-l**	8.12 **n-q**	9.28 **g-p**	10.46 **a-j**	10.08 **a-l**	7.16 **Q**	10.726 **A**	10.64 **ab**	10.68 a
B4	9.25 **g-p**	9.18 **i-p**	9.33 **e-p**	10.47 **a-j**	10.07 **a-l**	9.21 **h-p**	9.14 **j-p**	9.28 **g-p**	10.38 **a-l**	10.01 **a-l**	9.66 **Cd**	9.57 **cd**	9.62 b
B5	8.16 **m-q**	10.34 **a-l**	9.71 **c-l**	10.33 **a-l**	10.51 **a-i**	8.12 **n-q**	10.22 **a-l**	9.64 **c-l**	10.24 **a-l**	10.38 **a-l**	10.35 **Ab**	10.28 **ab**	10.31 b
B6	9.09 **k-p**	9.19 **h-p**	9.43 **d-n**	10.65 **a-f**	9.96 **a-l**	9.06 **l-p**	10.74 **a-d**	9.34 **e-p**	10.58 **a-g**	9.65 **c-l**	10.10 **Bc**	9.36 **d**	9.73 b

Items	Interaction between transactions and classes						Interaction between fillings and varieties		Average items
	B1	**B2**	**B3**	**B4**	**B5**	**B6**	**A1**	**A2**	
C1	8.07 **l**	9.07 **Jk**	10.28 **b-f**	9.30 **g-k**	10.10 **b-h**	9.74 **d-j**	9.47 **Bc**	9.38 **c**	9.42 b
C2	9.15 **i-k**	9.12 **Jk**	10.80 **ab**	9.67 **e-j**	10.42 **a-e**	8.64 **Kl**	9.91 **Ab**	9.36 **c**	9.63 **b**
C3	8.13 **l**	9.12 **Jk**	10.69 **a-c**	9.38 **g-k**	10.28 **b-f**	10.04 **c-j**	9.63 **Bc**	9.58 **bc**	9.60 **b**
C4	9.23 **h-k**	9.30 **g-k**	11.16 **a**	10.32 **a-e**	10.61 **a-d**	10.44 **a-e**	10.22 **A**	10.13 **a**	10.18 **a**
C5	8.14 **l**	9.16 **i-k**	10.49 **a-e**	9.41 **f-k**	10.16 **b-g**	9.80 **c-j**	9.58 **Bc**	9.47 **bc**	9.52 **b**
Average fillings							9.76 A	9.58 a	

Means with same letter for each trait did not significantly different

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2. **Number of green leaves (leaf .plant^{-1}):** The results of my table (5) indicate that there are no significant differences between the two plants. As for the parameters, the concentration (B3) was superior, giving it the highest average of 10.68 leaves. Plant^{-1} compared to the control treatment (B1), which gave the lowest average of 8.54 leaves. Plant^{-1} This is due to the role of acid in activating the metabolic process, forming the apical meristem, growth and development of the roots, regulating the flowering process, and improving vegetative growth. As for the effect of the varieties, the results showed that there were significant differences between the averages of the trait, as the Giza variety excelled, which gave the highest values, amounting to 10.18 leaves. Plant^{-1}, while the variety Rabeh obtained the lowest values, reaching (9.42) leaves. Plant^{-1} The reason for the superiority of some varieties in this trait may be due to the variation in the ability and efficiency of genetic varieties in benefiting from the products of photosynthesis, which was reflected in the variation in most of their characteristics, including the characteristic of the number of green leaves. The triple interaction between the first treatment, the second treatment, and the Li variety achieved the highest average of 11.19 leaves. Plant^{-1}, while the interaction between the two plots and the treatments occurred, as the interaction between the first plot and the third treatment had the highest average, amounting to 10.72 leaves. Plant^{-1}, while the interaction of the second planting and the first treatment gave the lowest average for the trait, amounting to (8.52) leaves. Plant^{-1}, while the triple interaction between the second plot, the second treatment, and the variety Rabeh, the second plot, the third treatment, and the Li variety gave the same average of 11.14 leaves. Plant^{-1}.

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Table (5): Effect of treatments, varieties, cuttings, and their two- and three-way interactions on the number of green leaves (leaf.plant^{-1}).

Items / Transactions	Triple interaction between units, transactions, and classes										Interaction between entries and transactions		Average female workers
	The first filling					The second filling							
	C1	**C2**	**C3**	**C4**	**C5**	**C1**	**C2**	**C3**	**C4**	**C5**	**A1**	**A2**	
B1	1005.32 **tu**	1256.22**o-s**	1853.38**abc**	1752.29**a-d**	1531.18**e-l**	1003.74**tu**	1237.78**p-s**	1812.01**a-d**	1735.17**a-e**	1497.06**f-m**	1261.96 ef	1239.69 **f**	1250.82e
B2	1198.72 **q-t**	1398.28**k-r**	1921.43**a**	1504.67**f-l**	1409.33**j-r**	1174.20**st**	1375.59**l-s**	1884.65**ab**	1479.41**g-n**	1369.86**l-s**	1342.02 **e**	1322.53 **ef**	1332.28d
B3	1341.63 **l-s**	1491.25**f-m**	1702.23**b-f**	1441.22**i-p**	1439.27**i-p**	1331.03**l-s**	1462.25**h-o**	1687.67**b-g**	1405.49j-r	952.97**u**	1559.62 **bc**	1739.60 **a**	1754.14a
B4	1482.79 **g-n**	372.67**l-s**	1354.34**l-s**	1528.26**e-l**	1691.65**b0g**	1422.85**i-p**	1356.46**l-s**	1328.95**l-s**	1498.14**f-m**	1641.25**c-i**	1632.06 **b**	1537.94 **c**	1548.78c
B5	1281.32 **m-s**	1641.12**c-i**	1492.35**f-m**	1783.23**a-d**	1873.99**ab**	1266.62**n-s**	1608.49**d-k**	1477.57**g-n**	1758.11**a-d**	1783.17**a-d**	1632.06 **b**	1604.22 **bc**	1618.14b
B6	1191.68 **rst**	1725.27**a-e**	1694.44**b-f**	1876.42**ab**	1623.30**d-j**	1180.56**st**	1705.18**b-f**	1668.61**b-h**	1862.29**ab**	1422.85**j-q**	1607.51 **bc**	1431.74 **d**	1519.62c

Items	Interaction between transactions and classes						Interaction between fillings and varieties		Average items
	B1	**B2**	**B3**	**B4**	**B5**	**B6**	**A1**	**A2**	
C1	1004.53**m**	1186.12**l**	1624.80**ef**	1341.64**ijk**	1423.36**g-j**	1389.60**h-k**	1340.50 **e**	1316.18 **e**	1328.34e
C2	1186.46**l**	1247.00**kl**	1715.23**cde**	1484.96**f-i**	1513.20**fg**	1196.12**l**	1440.02 **d**	1340.97 **e**	1390.49**d**
C3	1336.33**jk**	1386.94**h-k**	1832.70**abc**	1681.52**de**	1770.67**a-d**	1666.45**de**	1627.10 **bc**	1597.77 **c**	1612.43**b**
C4	1452.82**g-j**	1476.75**g-j**	1903.04**a**	1743.73**b-e**	1869.35**ab**	1828.58**abc**	1733.03 **a**	1691.73 **ab**	1712.38**a**
C5	1273.97**kl**	1364.57**h-k**	1694.95**cde**	1492.04**fgh**	1514.12**fg**	1517.37**fg**	1502.56 **d**	1449.78 **d**	1476.17**c**
Average fillings							1528.64 a	1479.29 a	

Means with same letter for each trait did not significantly different.

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3. Leaf area (cm^2. $Plant^{-1}$):

The results of (6) indicate that there are no significant differences between the two plants, and for the treatments, treatment (B3) excelled in giving the highest average for the trait, amounting to 1754.14 cm^2. Plant-1, while treatment B1 gave the lowest average for the trait, amounting to (1250.82) cm^2. $Plant^{-1}$. The reason for this can be attributed to the role of ascorbic acid in increasing the total chlorophyll content of the leaves and the effect of this in increasing the substances resulting from the photosynthesis process (sugars). kidney manufactured in leaves) As for the effect of the varieties, the results showed that there were significant differences between the averages of the trait, as the Giza variety excelled by giving the highest average for the trait, amounting to 1712.38 cm^2. $Plant^{-1}$, while the Rabeh variety gave the lowest average for the trait, amounting to 1328.34 cm^2. $Plant^{-1}$, and this increase is due to To the variation of the varieties in the leaf area characteristic, to their variation in the number of leaves, the reason for this difference between the varieties of white corn in this trait may be attributed to their variation in the number of leaves, in addition to their variation in the speed of its growth until reaching the maximum leaf area. As for the triple interaction between the mowings, treatments, and varieties, it excelled. The interaction between the first planting and the second treatment, and the variety Li, the highest average for the trait reached 1921.43 cm^2. $Plant^{-1}$. While the triple interaction between the second plot, the first treatment, and the variety Rabeh gave the lowest average, amounting to 1003.74 cm^2. $Plant^{-1}$ **Aswad** et all… (2019).

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Table 7: The effect of treatments, varieties, weeds, and their two- and three-way interactions on the chlorophyll (SPAD) content of leaves.

Items	Triple interaction between units, transactions, and classes										Interaction between entries and transactions		Average female workers
	The first filling					The second filling							
Transactions	**C1**	**C2**	**C3**	**C4**	**C5**	**C1**	**C2**	**C3**	**C4**	**C5**	**A1**	**A2**	
B1	22.60 **x**	40.18 **j-n**	44.19 **d-k**	50.22 **a-c**	41.69 **g-l**	21.18 **x**	38.10 **l-q**	42.82 **e-l**	47.33 **b-f**	39.62 **k-o**	35.49 **E**	33.46 **f**	34.4 D
B2	36.26 **n-r**	42.20 **h-l**	52.69 **A**	41.18 **h-m**	30.66 **s-u**	34.12 **p-s**	41.12 **i-m**	51.12 **ab**	39.60 **k-o**	28.30 **t-v**	38.61 **Cd**	36.84 **de**	37.7 C
B3	40.18 **j-n**	48.00 **a-d**	42.16 **g-l**	35.12 **o-s**	46.22 **c-h**	38.20 **l-p**	46.64 **b-g**	40.12 **j-n**	33.22 **q-s**	33.43 **p-s**	44.61 **A**	42.64 **ab**	43.6 A
B4	44.77 **d-i**	36.29 **m-r**	30.64 **s-u**	47.35 **b-f**	42.62 **f-l**	42.12 **g-l**	34.18 **p-s**	28.12 **t-v**	45.79 **c-i**	40.00 **j-n**	42.06 **B**	39.54 **c**	40.8 B
B5	33.68 **p-s**	35.79 **n-r**	45.82 **c-i**	44.18 **d-k**	51.18 **Ab**	31.72 **r-t**	33.54 **p-s**	42.24 **g-l**	42.64 **f-l**	47.73 **b-e**	43.92 **Ab**	42.07 **b**	43.0 A
B6	26.38 **u-w**	48.26 **a-d**	42.46 **f-l**	51.29 **ab**	41.67 **g-l**	24.18 **v-x**	45.62 **c-i**	40.44 **j-n**	49.12 **a-d**	40.13 **j-n**	42.47 **B**	37.91 **cd**	40.19 B

Items	Interaction between transactions and classes						Interaction between fillings and varieties		Average items
	B1	**B2**	**B3**	**B4**	**B5**	**B6**	**A1**	**A2**	
C1	21.89 **l**	25.28 **K**	34.66 **i**	29.38 **J**	34.17 **I**	29.48 **J**	30.19 **F**	28.09 **g**	29.14 D
C2	35.19 **i**	39.14 **H**	46.94 **cd**	44.03 **Def**	46.57 **Cde**	39.82 **H**	44.01 **C**	39.88 **d**	41.94 **B**
C3	39.19 **h**	41.66 **Fgh**	43.50 **efg**	41.45 **fgh**	43.41 **Efg**	41.31 **Fgh**	42.63 **C**	40.87 **d**	41.75 **B**
C4	43.44 **efg**	47.32 **Bc**	51.90 **a**	48.77 **abc**	50.20 **Ab**	49.45 **Abc**	49.69 **A**	47.34 **b**	48.51 **A**
C5	32.70 **i**	35.23 **I**	41.14 **fgh**	40.39 **gh**	40.65 **Fgh**	40.90 **Fgh**	39.44 **D**	37.56 **e**	38.50 **C**
Average fillings							41.19 A	38.74 b	

Means with same letter for each trait did not significantly different.

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4. Chlorophyll (SPAD) content of leaves:

The results of Table (7) indicate that there are significant differences between the two plots, as the first plot excelled with an average of 41.19 SPAD, while the second plot gave 38.74 SPAD. As for the effect of the treatments, treatment (B3) excelled in giving the highest average of 43.60 SPAD, while treatment (B1) gave the lowest average of 34. 40. Spad. The reason is due to the role of kinetin in maintaining the levels of chlorophyll pigments by inhibiting the RNA ase enzyme and inhibiting the decomposition processes of chlorophyll, and the role of acid in building protein, carbohydrates, and chloroplasts, and increasing the enzymes responsible for photosynthesis. As for the effect of the varieties, the results showed that there were significant differences between the averages of the trait, as the Giza variety excelled by giving the highest average of 48.51 SPAD, while the Rabeh variety gave the lowest average of 29.14 SPAD. The reason for the superiority of the Giza variety over the rest of the other varieties is due to the difference in genetic composition and the extent of its susceptibility. To benefit from the products of photosynthesis and the accumulation of dry materials in the leaves, to control genes to calculate the synthesis of chlorophyll, and to take advantage of the available conditions. The three-way interaction between the plots, treatments, and cultivars had significant differences in the trait, as the interaction between the first plot, the second treatment, and the Li variety had the highest average for the trait, amounting to 52.69, while the three-way interaction between the second plot, the second treatment, and the Li variety gave the highest average, amounting to 51.12 spades.

CONCLUSIONS

It was found that the third treatment level, 60 mg/L, had the highest significant average for plant height, number of branches per plant, number of green leaves, number of grains in a row, number of grains per cob, grain yield per plant, leaf area, and chlorophyll content of leaves. It showed good average performance for all traits, followed in importance by Lilo, then J and Save. It was also shown that the productivity of the first crop was superior in the first season for all traits studied, and this is useful in the reliability of these traits as selection criteria for higher production performance in breeding and selection programs.

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