The effect of combinations of growth regulators on the efficiency of dry matter distribution and its relationship to fodder yield characteristics and quality for *Sorghum bicolor* (L.) Moench

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Abstract
A field experiment was carried out at the research station of the Field Crops Department at the College of Agriculture at Tikrit University during the two agricultural seasons 2021-2022 AD and 2022-2023 AD. To study the effect of six combinations of kinetin and ascorbic acid (0, 20, 60, 20+60, 20+30, and 10+60 mg.l-1 in five varieties of white surghum (Rabah, J, Li ,Giza and Inkath) in two plantings. The experiment was applied according to a randomized complete block design (R.C.B.D.) and with three replications according to the Split_ Split plots arrengment The main plots included the six treatments, the secondary panels included the five corn varieties, and the sub-secondary plots included the two crops. I studied the traits of green fodder yield, dry matter percentage, dry matter yield, protein percentage in leaves%, and fiber percentage in leaves%. The Giza variety excelled in recording the highest arithmetic mean in most of the studied traits, while the J variety recorded the highest arithmetic averages in the protein percentage trait in the leaves in the first and second seasons. The second season gave the highest arithmetic averages in the dry matter percentage and the protein percentage in the leaves. The interaction was between the three study factors. Highly significant in all the studied traits. The intervention treatment variety (Li x concentration 20 mg.l-1 x first cutting) after 45 days of planting was distinguished by recording the highest averages for most of the studied traits, while the combinatorial treatment (varieties Rescue x 60 mg.l-1 x second cutting) gave the result. After 50 days of the first cutting, the treatment was superior to the crop growth rate and dry matter yield (varieties x j + 60 mg.l-1 x first cutting) after 45 days of planting.

Keywords: vegetable fodder yield, protein, crop growth rate.

Introductio

Sorghum (L.) Moench, is one of the fodder crops that ranks fifth in the world in terms of cultivated area and production. Its local fodder production amounts to 363.8 kg per ha and the cultivated area is about 10,007 dunums (Central Bureau of Statistics, 2021). Due to the decrease of green fodder, especially in the summer, it is necessary to further expand the cultivation of summer green fodder crops, such as white corn. Expanding its cultivation

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during the summer will revive livestock in the central and southern region.

It is the main substance in concentrated feed for poultry due to its high protein content (Al-Sahel, 2020) White corn 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 lead to Increasing the yield of green fodder, which has a desirable nutritional value. The importance of fodder crops comes from the fact that they are the basic foundation for developing livestock, which suffer from a major problem, which is the lack of green fodder during the summer months. Providing green fodder is a basic condition for developing this wealth. What we see today is a clear scarcity in the provision of green fodder, the deteriorating condition of livestock, and the decline of areas. Pastures due to dry seasons are the best evidence of this 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 in 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 the plant produces. By activating carbon metabolism and dry matter production, kinetin is one of the types of cytokinins that plays an important role in encouraging the movement and transfer of nutrients towards the areas treated with it, as they are areas of high metabolism, in addition to its effects on the development of flowers and fruits, encouraging cell division and germination of the resulting seeds, and its role in the formation of chloroplasts, especially the. Chlorophyll pool center and delay It delays aging, in addition to its role in breaking the apical dominance, increasing the number of branches, and entering into the formation of RNA, which is important for protein 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. This acid is one of the important growth regulators that positively affects the growth of plants because it is an antioxidant and works to remove... It removes toxins from plants and helps encourage the construction of proteins by stimulating an increase in the plant's RNA content. This vitamin acts as a regulator and stimulant for the flowering process, carbon metabolism, and the growth and development of the vegetative and root systems. Estimating genetic parameters, especially those related to phenotypic and genetic variations.

The environment is important for plant breeders, as genetic variation is the effective tool influencing the efficiency of selection. In addition to that, the estimation of heritability and expected genetic improvement is based on the selection method used to improve it (Akatwijuka et al., 2019), as genotypes vary in phenotypic traits resulting from the interaction between variation. Genetic, environmental, and quantitative traits. Each genetic makeup has characteristics that differ from the other. Given the nutritional and fodder importance of this crop, it was necessary to search for a way to increase its production capacity using scientific methods, as the genetic makeup varies in phenotypic traits resulting from the interaction between genetic and environmental variation and quantitative traits. Each genetic makeup is distinguished. With characteristics that differ from each other and the cultivation of new inputs

High productivity and comparing its production with the local variety is one of the most important goals of breeders of this crop and the suitability of these inputs to the prevailing environmental conditions in the region, which is one of the basic factors that contribute to increasing the cultivation and spread of the crop. Estimating the genetic parameters is one of the priorities of breeding programs to achieve genetic progress that establishes An appropriate breeding method. Therefore, the idea of this study came to achieve the following objectives:

-1Testing the genotypes of sorghum and determining the best ones in response to combinations of growth regulators.

-2Knowing the effect of different concentrations and combinations of kinetin and ascorbic acid and determining the concentration that gives the highest green fodder yield and dry matter of the best quality. Determine the best combination between varieties and growth regulator combinations to give the best green fodder yield and dry matter quality. Hameed and others (2015) reported that the effect of spraying with ascorbic on genotypes of sorghum at concentrations of 40, 60, and 80 mg. l-1, as well as the control treatment (without spraying with ascorbic), showed that plants sprayed at a concentration of 60 mg. l-1 is the highest average for plant height, number of leaves per plant, green fodder yield, and chlorophyll content of leaves.

Materials and methods :

A field experiment was carried out at the research station of the Crops Department at the College of Agriculture at Tikrit University during the two agricultural seasons (2021_2022) and (2022_2023). The experiment included five varieties of Sorghum obtained from the Field Crops Department at the College of Agriculture - Anbar University. The experimental land was plowed using a plow The excavator, because the soil was gypsum, was blessed with the available smoothing machines, and nitrogen fertilizer was added to it in an amount of 200 kg. ha-1 In the form of urea (46% N) as a source of nitrogen, in two batches, the first at planting when preparing the field land, and the other half was added 30 days after adding the first batch. Phosphate fertilizer was also added before planting, mixed with the soil and at a level of (120). kg.ha-1 in the form of triple superphosphate (P_2O_5) 46% - 45%) and as a source of phosphorus in one batch (Sabahi, 2011 (

Planting took place in the seasons 2021-2022 and 2022-2023 AD, and the area of the experimental unit was (2.5 x 3) m2. Five lines were planted in each experimental unit, and the distance between one line and another was (50) cm, the length of the line was (3) m, and the quantity of seeds was (8). kg. h-1. The experiment was irrigated after planting and fertilizing, and other irrigations were given as needed. Granulated diazinon pesticide (10%) was used as an effective substance to combat the corn stalk borer (Sesamia cretica) in an amount of 6 kg.ha-1 twice, the first 20 days after planting and the second 20 days after the first control (Al-Younis, 1993). The growing bush was controlled. In the field with the crop by manual weeding. A collective sample of the field soil was taken at a depth of (30) cm after scraping the surface of the ground to a depth of 5 cm to estimate its physical and chemical characteristics before planting and in both planting seasons.

The studied characteristics:

Yield of green fodder (ton.ha-1:(

The plants were mowed manually from the two middle lines of each experimental unit according to the mowing stage and at a height of 15 cm from the soil surface (Radwan and Al-Fakhry, 1976). Then the green fodder yield was weighed immediately after mowing to avoid moisture loss due to evaporation, using an accurate electronic balance, after which it was converted The yield of green fodder for the two middle lines of the experimental unit to the yield of green fodder in hectares.

Dry matter yield (ton.ha-1 :(

The dry matter yield was estimated from the following equation :

Dry matter yield = green fodder yield x dry matter percentage .

Dry matter percentage:

It was estimated by taking three plants from each experimental unit, and they were cut, weighed directly, and placed in perforated paper bags, and then dried at a temperature

° 105)C) for three hours of rapid drying, and the percentage of dry matter was calculated from the following equation (Al-Jubouri, 1992:(

Percentage of dry matter Dry weight/ Wet weight x 100

Protein percentage in leaves:(%)

The percentage of crude protein in the leaves was estimated using a Micro Kjeldahl nitrogen device, according to the method used to estimate the percentage of nitrogen in the leaves, and then the result was multiplied by 6.25 according to (A.O.A.C, 1975) and as in the following equation:

Percentage of crude protein in leaves = percentage of nitrogen x 6.25.

Percentage of fiber in leaves:(%)

The percentage of fibers was calculated using a Tecator fibertic system device according to the method used in (A.O.A.C, 1975.(

Table (1) Some physical and chemical characteristics of the experimental soil:

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	

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Results and discussion :

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green Yield (ton.ha-1(

The data in Table (2) showed that there are significant differences between the averages of the treatments in the trait, as treatment B3 gave the highest average for the trait, amounting to (38.97) ton. ha -1 The lowest average recorded by treatment B1 for the trait was(31.09) ton. ha -1 The reason is due to the superiority of treatment B3 in increasing the absorption of the necessary elements for the plant, especially nitrogen, which led to an impact on the overall physiological activity of the plant by increasing the products of the carbon assimilation process, which affected the increase in the amount of dry matter positively and thus increased its fodder yield. My contribution also Increasing the height of the plant (Table 3), the number of branches in the plant the number of leaves), and the leaf area

In plants, which are considered the main components of green fodder yield, these characteristics together increase the photosynthesis process by intercepting the greatest amount of sunlight and thus increasing the synthetic materials in the leaf. Ziki et al., (2019) and this result agreed with (Hameed et al., 2015) and (Ghaderi et al., 2018.(

The effect of the averages of the varieties was significant on the trait, as the Giza variety recorded the highest average for the trait, amounting to (45.48) ton. ha -1 and the lowest average recorded by Rabeh was (27.93) ton. ha -1 This is due to its superiority in plant height, the number of branches in the plant (Table 24), the number of leaves (Table 25), and the leaf area (Table 28.(

In plants, which are considered the main components of green fodder yield, these characteristics together increase the process of photosynthesis by intercepting the greatest amount of sunlight and thus increasing the synthetic materials in the leaf (Jiyad et al., 2014.(

The effect of the averages of the two crops on the trait was significant, as A1 gave the highest average for the trait, amounting to (40.11) ton. ha-1 compared to A2, which gave a lower average for the characteristic, amounting to (29.64) ton. ha -1This is due to the increase in plant height (Table 23), in addition to the accumulation or increase of all dry matter and the number of leaves in the plant, in addition to the fact that the yield of green fodder increases as the plant ages. Asal (2019) and this result agreed with what was concluded by (Asal ,2019.(

The interaction between the averages of treatments and varieties was significant for the trait, as the compatible treatment (C4xB5) recorded the highest average for the trait, amounting to (48.50) ton.ha -1, while the compatible treatment (C1xB1) recorded the lowest average of the characteristic, amounting to (24.15) ton.ha-1 .

The bilateral interaction between the averages of the plots and treatments was significant for the trait, as the compatible treatment (B3xA1) had the highest average for the trait, amounting to (39.39) ton.ha-1, while the compatible treatment (B1xA2) recorded the lowest average of the characteristic, amounting to (33.64) ton.ha-1.

The two-sided interaction between the averages of weeds and varieties was significant for the trait, as the compatible treatment (C4xA1) recorded the highest average for the trait, amounting to (46.57) ton. ha-1 The lowest average quality recorded by the binary treatment (C1xA2) was (27.45) ton.ha-1.

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The three-way interaction between the averages of the plots, treatments, and varieties was significant in terms of the trait, as the treatment gave the three-way agreement (C4xB6xA1(

The highest average for the trait reached (49.67) ton. ha -1 The lowest average was for the triple combination (C1xB1xA2) amounting to (24.13) ton.ha-1

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Table (2) Effect, coefficients, industrialization, chat, and their two- and three-way interactions on green yield (ton.ha-1(

Mean of treatment	Interaction between filling and treatment		Triple Interaction between Varieties, treatment and filling										Varieties / treatment
			The seconed filling					The first filling					
	A2	A1	Inkath	Giza	Lilo	J	Rabih	Inkath	Giza	Lilo	J	Rabih	
31.09 f	29.64 j	32.53 h	27.45 x	46.62 g	38.95 op	38.61 pq	20.21 g	29.77 v	49.90 f	40.69 lm	40.78 lm	20.96 f	B1
32.74 e	31.51 l	33.97 g	22.49 e	24.12 c	52.64 D	30.26 uv	38.18 q	24.90 ab	26.97 x	57.44 a	32.40 t	40.77 lm	B2
38.97 a	37.82 c	40.11 a	39.73 n	23.12 de	29.67 V	45.12 hi	41.44 l	42.80 k	25.12 a-z	30.72 t	49.48 f	30.18 uv	B3
33.80 d	32.71 h	34.89 f	33.29 s	41.40 l	21.18 F	23.32 d	25.18 a-z	35.25 r	44.84 i	22.52 e	25.81 yz	45.60 h	B4
37.80 b	36.51 e	39.08 b	50.67 c	39.38 no	39.88 N	24.29 bc	23.20 d	53.55 c	40.52 m	41.18 lm	26.28 y	25.18 a-z	B5
35.81 c	34.62 f	37.01 d	26.92 x	51.24 e	31.78 T	43.58 j	20.24 g	28.59 w	55.18 b	33.90 s	45.44 hi	21.38 f	B6

Mean of varieties	interaction between filling and varieties		Interaction between treatment and varieties						varieties
	A2	A1	B6	B5	B4	B3	B2	B1	
22.724 e	21.92 j	23.52 i	23.69 s	24.12 rs	21.85 t	25.28 q	20.81 u	20.58 u	Rabih
41.43 b	40.23 d	42.63 c	41.26 h	43.12 g	40.53 i	44.51 f	39.69 j	39.47 j	J
34.31 c	33.14 f	35.49 e	34.27 k	39.95 j	32.84 l	39.82 j	31.33 m	27.68 p	Lilo
49.906 a	47.95 b	51.85 a	52.11 c	53.21 b	48.26 d	55.04 a	47.300 e	43.52 g	Giza
26.81 d	25.78 h	27.84 g	27.75 p	28.61 o	25.54 q	30.19 n	24.56 r	24.19 r	Inkath
	33.80 b	36.27 a	Mean of filling						

Dry matter percentage (%)

The results of Table (3) indicate that there are significant differences between the averages of the treatments in the trait, as Treatment B3 gave the highest Mean for the trait amounting to (27.02)% compared to Treatment B1, which gave the lowest average for the trait amounting to (21.17)%. The reason is that Treatment B3 has balanced Nutrients present in the soil, which increased their readiness and absorption by the plant, thus increasing the accumulation of dry matter. This result is in line with (Lo'Ay and El-Khateeb, 2018), which indicated that there were significant differences between the averages of the treatments .

The statistical differences were significant between the averages of the varieties in the trait, if the Giza variety excelled, with the highest average for the trait reaching (27.20)% and the lowest average recorded by the Rabeh variety reaching (21.61)%. The reason is due to the genetic ability of the variety to increase the absorption of nutrients more efficiently than other varieties.

The other, which was reflected positively in increasing the trait.

The effect of the averages of the two decks was significant on the trait, as A1 recorded the highest average for the trait, amounting to (22.72)%, superior to A2, which gave a lower average for the trait, amounting to (21.55)%. The result is in line with (Ajeigbe et al., 2018.(

The effect of the interaction between treatments and varieties was significant on the trait, as the compatible treatment (C4xB3) recorded the highest average for the trait, amounting to (31.60)%, while the compatible treatment (C1xB1) recorded the lowest average for the trait, amounting to (17.82.%(

The bilateral interaction between the averages of the plots and the treatments was significant in terms of the trait, as the interfering treatment (B3xA1) excelled with the highest average for the trait, amounting to (28.21)%, compared to the interfering treatment (B1xA2), which recorded the lowest average for the trait, amounting to (20.68.%(

The effect of the interaction between the means of weeds and varieties was significant on the trait, as the binary treatment (C4xA1) gave the highest average for the trait, amounting to (26.14)%, while the combinatorial treatment (C1xA2) gave the lowest average for the trait, amounting to (19.30.%(

The three-way interaction between the study factors was significant in the trait, as the tripartite treatment (C3xB2xA1) recorded the highest average for the trait, amounting to (32.33)%, compared to the tripartite combinatorial treatment (C1xB1xA2), which gave the lowest average for the trait, amounting to)
.%(18.68

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Table (3) Effect of treatments, varieties, fillings, and their two- and three-way interactions on the dry matter percentage

Mean of treatment	Interaction between treatment and varieties		Triple Interaction between Varieties, treatment and filling										Varieties / treatment
			Th seconed filling					The first filling					
	A2	A1	Inkath	Giza	Lilo	J	Rabih	Inkath	Giza	Lilo	J	Rabih	
21.17 e	20.68 h	21.67 g	22.69 r-t	24.67 k-m	27.54 F	21.84 t-v	18.68 z	23.90 m-p	26.70 gh	29.53 cd	22.95 q-s	19.45 yz	B1
22.37 d	21.87 g	22.87 f	22.90 q-s	20.45 x	30.24 bc	22.67 r-t	20.28 xy	23.23 p-s	22.60 s-t	32.33 a	23.78 n-q	21.30 vw	B2
27.02 a	26.04 c	28.00 a	24.59 l-n	21.67 uv	22.34 s-u	24.54 l-n	21.60 uv	27.20 f-h	22.73 r-t	26.40 g-i	25.62 ij	22.63 st	B3
22.91 d	21.95 g	23.87 e	26.65gh	20.37 x	20.40 X	20.23 xy	23.76 n-q	28.73 de	25.70 ij	21.44 vw	21.30 vw	24.90 j-l	B4
24.19 c	22.88 f	25.50 cd	28.57 e	24.23 l-o	21.67 uv	23.56 o-r	19.09 yz	30.87 b	26.33 hi	23.73 n-q	24.53 l-n	20.10 xy	B5
26.01 b	25.07 d	26.95 b	22.67 r-t	25.47 jk	22.56 s-t	26.55 gh	20.07 xy	24.73 k-m	28.87 de	24.89 j-l	27.23 fg	20.73 wx	B6

Mean of Varieties	Interaction between filling and varieties		Interaction between treatment and varieties						Varieties
	A2	A1	B6	B5	B4	B3	B2	B1	
21.61 e	21.21 h	22.01 g	23.06 l	22.20 m	20.92 o	24.04 ij	20.40 o	19.06 p	Rabih
23.61 c	22.55 f	24.68 c	25.89 f	23.03 l	22.70 lm	26.89 e	22.39 m	20.79 o	J
25.09 b	24.20 d	25.98 b	27.69 d	25.28 gh	23.72 jk	28.53 c	23.22 kl	22.11 n	Lilo
27.21 a	26.20 b	28.21 a	29.72 b	27.17 de	25.68 fg	31.28 a	25.08 h	24.33 i	Giza
22.20 d	21.24 h	23.17 e	23.70 jk	23.29 kl	21.52 n	24.37 i	20.76 o	19.59 p	Inkath
	23.08 b	28.81 a	Mean of filling						

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protein in leaves(%)

The results of Table (4) indicate that the effect of the average treatments was significant on the trait, as treatment B3 gave the highest average for the trait amounting to (10.89)%, while treatment B1 covered the lowest average for the trait amounting to (8.76)%. The superiority of treatment B3 led to an increase in the DNA content. RNA is a catalyst for a number of enzymatic reactions, as it participates in the process of synthesizing hydroxylysine from lysine, which is involved in the manufacture of cell wall structural proteins. The result is consistent with (Ali et al., 2020.(

The effect of the averages of the varieties was significant in the trait, as the J variety was distinguished by the highest average of the trait, amounting to (10.98)%, compared to the Inkath variety, which recorded the lowest average of the trait, amounting to (8.34)%. The superiority of the variety is due to its genetic ability to respond to the third treatment, which excelled in increasing the acid content. Nuclear synthesis of proteins inside plant leaves, which reflects the cause of the trait

From the same table, we note that the effect of the averages of the two decks was significant on the adjective, as A1 recorded the highest average for the adjective, amounting to (10.15)%, while A2 gave the lowest average for the adjective, amounting to (9.44)%. This result agreed with (Sahu and Thakur, 2020.(

The interaction between treatments and classes was significant in terms of the trait, as the combinatorial treatment (C2xB3) recorded the highest average for the trait, amounting to (12.27)%, while the interventional treatment (C5xB1) gave the lowest average for the trait, amounting to (7.55.%(

The interaction between the averages of the plots and treatments was significant in the trait, as the interventional treatment (B3xA1) was characterized by the highest average for the trait, which amounted to (11.23)%, while the combinatorial treatment (B1xA2) gave the lowest average for the trait, which amounted to (8.49.%(

The interaction between the averages of the plots and the varieties was significant in the trait if the treatment was compatible
) C2xA1) gave the highest average for the trait, amounting to (11.43)%, while the compatible treatment (C1xA2) gave the lowest average for the trait, amounting to (9.36.%(

The three-way interaction between the means of the study factors was significant for the trait, as the triple interactive treatment (C2xB6xA1) gave the highest average for the trait, amounting to (12.51)%, while the interactive treatment (C1xB3xA1) gave the lowest average for the trait, amounting to (9.03. %(

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Table (4) Effect, treatments, manufacturing, chaat, and their two- and three-way interactions with protein in leaves%)

Mean of treatment	Interaction between filling and treatment		Triple Interaction between Varieties, treatment and filling										Varieties / Treatment
			The seconed filling					The first filling					
	A2	A1	Inkath	Giza	Lilo	J	Rabih	Inkath	Giza	Lilo	J	Rabih	
8.76 e	8.49 f	9.03 e	8.23 x	9.43 p-r	10.45 I	10.16 j-l	8.12 x	8.78 v	10.65 h	11.02e f	10.89 fg	9.08 tu	B1
9.35 d	9.12 e	9.59 cd	9.49 o-q	7.65 yz	10.74 Gh	9.33 q-s	9.23 st	10.88 fg	8.15 x	11.48 d	9.63 o	10.22 jk	B2
10.89 a	10.55 b	11.23 a	10.85 fg	9.43 p-r	9.10 Tu	9.12 tu	8.23 x	12.02 b	10.23 jk	10.03 lm	10.09 kl	9.03 u	B3
9.59 d	9.24 de	9.95 c	9.82 n	10.68 h	9.38 q-s	7.72 y	9.33 q-s	10.65 h	11.80 c	9.89 mn	7.80 y	9.29 rs	B4
9.88 c	9.38 de	10.37 b	10.74 gh	9.37 q-s	10.29 J	10.46 i	7.54 z	11.12 e	10.21 jk	11.18 e	11.13 e	7.56 z	B5
10.31 b	9.88 c	10.75 b	8.53 w	9.23 st	9.48 o-q	12.03 b	9.29 rs	9.08 tu	10.86 fg	9.88 mn	12.51 a	9.56 op	B6

Mean of Varieties	Interaction between filling and Varieties		Interaction between Varieties and treatment						Varieties
	A2	A1	B6	B5	B4	B3	B2	B1	
9.745 c	9.36 f	10.12 c	10.18 h	9.83 j	9.63 lm	10.79 f	9.42 o	8.600 rs	Rabih
10.98 a	10.54 b	11.43 a	11.43 b	11.24 c	10.73 f	12.27 a	10.52 g	9.725 j-l	J
9.75 c	9.44 e	10.07 c	10.23 h	9.79 jk	9.68 k-m	10.73 f	9.480 no	8.63 r	Lilo
10.17 b	9.76 d	10.58 b	10.93 e	10.04 i	10.04 i	11.11 d	9.60 m	9.31 p	Giza
8.34 d	8.12 h	8.56 g	8.805 q	8.50 s	7.90 t	9.56 mn	7.760 u	7.55 v	Inkath
	9.44 b	10.15 a	Mean of filling						

Mean of treatment	Interaction between filling and treatment		Triple Interaction between Varieties, treatment and filling										Varieties / Treatment
			The seconed filling					The first filling					
	A2	A1	Inkath	Giza	Lilo	J	Rabih	Inkath	Giza	Lilo	J	Rabih	
8.76	8.49	9.03	8.23	9.43	10.45	10.16	8.12	8.78	10.65	11.02e	10.89	9.08	B1

e	f	e	x	p-r	I	j-l	x	v	h	f	fg	tu	
9.35 d	9.12 e	9.59 cd	9.49 o-q	7.65 yz	10.74 Gh	9.33 q-s	9.23 st	10.88 fg	8.15 x	11.48 d	9.63 o	10.22 jk	B2
10.89 a	10.55 b	11.23 a	10.85 fg	9.43 p-r	9.10 Tu	9.12 tu	8.23 x	12.02 b	10.23 jk	10.03 lm	10.09 kl	9.03 u	B3
9.59 d	9.24 de	9.95 c	9.82 n	10.68 h	9.38 q-s	7.72 y	9.33 q-s	10.65 h	11.80 c	9.89 mn	7.80 y	9.29 rs	B4
9.88 c	9.38 de	10.37 b	10.74 gh	9.37 q-s	10.29 J	10.46 i	7.54 z	11.12 e	10.21 jk	11.18 e	11.13 e	7.56 z	B5
10.31 b	9.88 c	10.75 b	8.53 w	9.23 st	9.48 o-q	12.03 b	9.29 rs	9.08 tu	10.86 fg	9.88 mn	12.51 a	9.56 op	B6

Mean of Varieties	Interaction between filling and Varieties		Interaction between Varieties and treatment						Varieties
	A2	A1	B6	B5	B4	B3	B2	B1	
9.745 c	9.36 f	10.12 c	10.18 h	9.83 j	9.63 lm	10.79 f	9.42 o	8.600 rs	Rabih
10.98 a	10.54 b	11.43 a	11.43 b	11.24 c	10.73 f	12.27 a	10.52 g	9.725 j-l	J
9.75 c	9.44 e	10.07 c	10.23 h	9.79 jk	9.68 k-m	10.73 f	9.480 no	8.63 r	Lilo
10.17 b	9.76 d	10.58 b	10.93 e	10.04 i	10.04 i	11.11 d	9.60 m	9.31 p	Giza
8.34 d	8.12 h	8.56 g	8.805 q	8.50 s	7.90 t	9.56 mn	7.760 u	7.55 v	Inkath
	9.44 b	10.15 a	Mean of filling						

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fiber in leaves(%)

The results of Table (5) indicate that there are significant differences between the averages of the treatments in the trait, as treatment B6 gave the highest average for the trait amounting to (22.37)% compared to treatment B1, which gave the lowest average for the trait amounting to (20.51)%. The reason is that treatment B3 worked The action of digestive enzymes for carbohydrates, fats, and proteins in digested and undigested foodstuffs led to an increase in the rate of carbon metabolism, which was reflected positively in the percentage of fiber (Bybordi, 2012). This result was in line with (Ali et al., 2021), which indicated that there were significant differences between the averages. Transactions in the attribute.

The statistical differences were significant between the averages of the varieties in the trait, with the Giza variety excelling with the highest average for the trait reaching (23.67%) and the lowest average recorded by the Inkath variety reaching (20.52)This is attributed to the variety's ability to exploit environmental conditions well, which led to an increase in the outcomes of the assimilation process. Carbon in the leaves (source) and thus led to an increase in the percentage of fiber in the leaves (Mansour and Khuraibat, 2017.(

From the same table, we notice that there are significant differences between the averages of the two crops, as A2 gave the highest average for the trait, amounting to (22.88)%, while A1 gave the lowest average, amounting to (19.70)%. The superiority of A2 is attributed to the increase in fiber. As the plant ages, the leaves become more senescent, and the accumulation of carbohydrates increases in the percentage of lignin. Hemicellulose and cellulose are the main components of fiber (Al-Dulaimi, 2012), and the result agreed with (Kumar et al. 2019.(

The effect of the interaction between treatments and varieties was significant on the trait, as the compatible treatment C4xB1) recorded the highest average for the trait, amounting to (25.97)%, which did not differ significantly from the compatible treatment C4xB4) with the highest average amounting to (25.48), while the compatible treatment (C2xB1) recorded the lowest average. For the trait, it reached (16.82.%(

The bilateral interaction between the averages of the plots and the treatments was significant in terms of the trait, as the intervention treatment (B3xA2) excelled with the highest average for the trait amounting to (24.14)%, which was not significantly different from the binary treatment (B3xA2)) with the highest average for the trait amounting to (3.46)% compared to the intervention treatment (B1xA1). Which recorded the lowest average for the trait, amounting to (18.85.%(

The effect of the interaction between the averages of weeds and varieties was significant on the trait, as the binary treatment (C4xA2) gave the highest average for the trait, amounting to (24.81)%, while the combinatorial treatment (C3xA1) gave the lowest average for the trait, amounting to (16.71.%(

The three-way interaction between the study factors was significant in the trait, as the tripartite treatment (C3xB2xA1) recorded the highest average for the trait, amounting to, compared to the three-way combinatorial treatment (C1xB1xA2), which gave the lowest average for the trait, amounting to

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Table (5) Effect of treatments, varieties, cuttings, and their two- and three-way interactions on the fibers in leaves(%)

Mean of treatment	Interaction between filling and treatment		Triple Interaction between Varieties, treatment and filling										Varieties / Treatment
			The seconed filling					The first filling					
	A2	A1	Inkath	Giza	Lilo	J	Rabih	Inkath	Giza	Lilo	J	Rabih	
20.51 d	22.17 d	18.85 g	21.63 pq	25.57 c	23.41 f-j	23.42 f-j	22.03 o-p	20.44 tu	25.39 c	19.63 u	15.35 v	20.18 tu	B1
21.11 c	22.46 cd	19.76 f	22.63 j-o	21.71 p	26.79 B	21.82 op	23.12 f-k	22.38 k-p	20.69 st	12.46 w	20.18 tu	10.52 x	B2
20.64 d	24.14 a	17.14 h	21.95 n-p	22.80 j-n	22.74 j-n	23.92 efg	21.52 p-s	23.42 f-j	22.64 j-o	12.57 w	22.18 l-p	12.44 w	B3
21.44 bc	23.33 b	19.55 f	21.93 n-p	23.79 e-h	23.09 g-k	20.79 q-t	23.68 e-i	21.82 op	20.46 tu	20.68 st	20.77 rt	28.27 a	B4
21.67 b	22.92 bc	20.43 e	24.07 def	21.56 p-r	23.92 efg	23.36 f-j	20.52 t	23.92 efg	15.67 v	20.44 tu	20.57 t	22.86 i-m	B5
22.37 a	22.27 d	22.46 b	20.80 q-t	24.83 cd	22.40 k-p	24.40 de	22.38 k-p	20.79 q-t	22.97 h-l	10.56 x	20.50 t	20.35 tu	B6

Mean of Varieties	Interaction between treatment and Varieties		Interaction between Varieties and treatment						Varieties
	A2	A1	B6	B5	B4	B3	B2	B1	
21.92 b	22.71 c	21.13 e	22.50 c-f	22.72 dc	21.88 g-j	21.96 f-i	21.36 j-m	21.10 lm	Rabih
20.94 c	23.43 b	18.44 g	22.68 c-e	22.12 e-h	22.18 d-h	22.45 d-g	19.38 n	16.82 q	J
19.41 e	22.10 d	16.71 h	21.87 g-j	18.61 o	16.48 q	21.52 i-l	21.00 lm	16.98 q	Lilo
23.67 a	24.81 a	22.53 c	23.99 b	23.90 b	25.48 a	19.62 n	23.05 c	25.97 a	Giza
20.52 d	21.36 e	19.68 f	20.79 m	21.03 lm	21.20 klm	17.65 p	20.78 m	21.69 h-k	Inkath
	22.88 a	19.70 b	Mean of filling						

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