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The effect of three levels of potassium and the dates of planting seedlings in the field on the yield, growth and quality of the stevia crop

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Abstract

A field experiment was conducted in an organic fertilizer preparation project located in Shatra District, which is 45 km north of Dhi Qar Governorate, during the 2022-2023 agricultural season, to study the effect of seedling planting dates (the first date is 1/12, the second date is 12/15, the third date is 12/30, the fourth date is 1/15, and the fifth date is 1/30), and levels of potassium fertilization (0, 25, 50 and 75 kg K ha-1). As for the interaction between them in terms of the growth, yield, and quality of the stevia crop, the experiment was carried out in accordance with a randomized complete block design (RCBD), with a split plot design, and with three replications. In the primary panels, the dates for planting seedlings were determined, and the levels of potassium fertilization in the secondary plots were determined. The results showed that the first date (1/12) recorded a significant increase in the leaf area , the total yield of dry leaves of the plant and plant height compared to the comparison treatment, as their averages reached 97.0 and 217.4 plant $^{-1}$ dc for the two mowing , 25.81 megagrams ha-1 and 104.72 cm, in the sequence. While the increase in potassium levels led to a significant increase in most of the studied traits, compared to the control treatment, the K3 fertilizer level (75 kg potassium ha-1) recorded a noticeable increase in both the leaf area trait of the plant , the chlorophyll index, plant height and number of main branches, the average of which reached 194.9 plant dc-1. And 21.42 spad,92.76 cm and 8.61branches per plant^{-1} for the second mowing in the sequence, the above fertilizer level also gave a significant increase in Rebaudioside A, which averaged 136.65 and 132.35, in the sequence, for both mowings. as for the effect of the interaction between potassium levels and dates, the combination treatment was superior to D1K1 (25 kg. Potassium h-1 with the first date D1 1/12), D5K2 (50 kg. Potassium ha-1 and the fifth date D5 30/1) and D4K3 (75 Kg. Potassium H-1 and the fourth date D4 15/1) in leaf area, chlorophyll index, potassium content of leaves, and total yield of dry leaves, which amounted to 111.5 plant fat-1, 31.79 spores, 20.12 µg/g, and 28.94 µg/h. -1 for the first mowing in the sequence.

Keywords: Date of planting, growing condition, Stevia rebaudiana*, *potassium fertilizer

Introduction

Stevia is a perennial herbaceous plant which stays in the soil for (5-7) years and relates to the Asteraceae family (Mubarak et al. 2008), Its leaves contain many sweetening substances, called Steviosids, that are a new type of natural sweetening substances extracted from its leaves, that are characterized by a low caloric value with a high sweetening , as their effect and ability to sweeten is 200-300 times the effect compared to cane or beet sugar at a minimum, as result, 80 kg of stevia sugar is equivalent to 16 tons of cane sugar, this high economic value and medical benefits (Barriocanal 2008) has promoted alot of countries to pay attention to these plant and settle it in their lands, particularly countries where its cultivation and production is successful and the expansion of its propagation and spread of its cultivation. The substances which are connected to the presence of glycosides and di-terpenoids, the most important of that are Steviosids and Rebaudioside A, are the most important substances in the stevia plant, that can·t

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be degraded or absorbed by the human digestive system, so that they don·t affect blood sugar levels and can prevent type 2 diabetes. In addition, there are lots of therapeutic uses for stevia, like anti-cancer, preventing tooth decay, and inhibiting fat accumulation)Dadhich et al., 2015(,Which makes it a safe choice to sugar at all ages. The border region between Brazil and Paraguay is considered the original origin of the stevia plant, and it is also grown in some parts of Asia and North America (Brandle et al., 2007).

The localization of these plant requires determining the best agricultural processes for it to include its natural growth and development, that is reflected in the yield and its quality. Among the most important of those processes is the date of planting in the field, that locates the success or failure of the plant in a given environment. due to the lack of studies which precisely locate the appropriate date, these factor has been put under research and over a wide range to ensure reaching the best date for field planting, In moreover, there is a study of the issue of potassium fertilization due to its functional importance in vital processes which affect plant growth and improve its productivity, It plays a role in photosynthesis directly by increasing leaf area and growth, and therefore increasing the production of CO2 gas, It else increases the rate of transfer of photosynthesis products, and that is due to the effect of potassium on increasing the ATP formed necessary to load (charge) the bark with photosynthesis products from the leaf to other organs (Hassanin, 2020).

Materials and Methods

The field experiment was conducted during the agricultural season of 2022-2023 in the Shatrah district in the fields of the organic fertilizer preparation project in silty clay soil. The physical and chemical characteristics of the soil are displayed in Table 1. The purpose of the experiment was to determine the response of the stevia plant to different planting dates and different levels of potassium fertilizer. The experiment was designed using the split-plate method, also known as the split plot design, and it was conducted using the Randomized Complete Block Design (RCBD) with three replications. The number of experimental units for each replicate was twenty, and the area of each experimental unit was one millimeter by one and a half meters. The distance between the replicates was two meters, and the distance between the experimental units was eighty centimeters. In each experimental unit, there are a total of twelve plants laid out in four lines, with a gap of thirty centimeters between each line and the next line, as well as thirty centimeters between each individual plant. In the past, these lines were planted with stevia plants, with three plants installed on each line, and they were equipped with a drip irrigation system. The experiment ensured a study of two factors: the first factor, four levels of potassium fertilizer (0, 25, 50, 75), and the second factor, planting seedlings with five dates (12/1, 12/15, 12/30, 1/15, 1/30) with The climatic data for the agricultural season was taken as shown in Table (2), and potassium sulphate fertilizer (50% K2SO4) was added according to the different treatments. It was added in two equal batches at planting and after the first mowing according to the different treatments. Service operations, including irrigation and pest control, were applied according to the needs of the crop.

In order to determine the potassium content of the leaves, the leaf area, the index of chlorophyll, Stevioside, and Rebaudioside A, as well as the total output of dry leaves, ten plants were selected at random from each experimental unit prior to the mowing process. After the data was collected and statistically processed in accordance with the methodology described above, the averages were compared by employing the least significant difference (LCD) method at a significance level of 5%. Al-Rawi and Khalafallah, 1980).

Table 1. Some pre-planting physical and chemical characteristics of the experimental soil

Chemical properties %							
EC ds.m^{1} Soil	EC ds.m^{1} water	pH water	pH Soil	O.M	K	P	N
					mg kg soil^{-1}		
3.4	2.1	7.02	7.87	1.7	169.75	13.5	27.23

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Physical properties%		
Soil separations %		
Clay	Silt	Sand
%27.23	%54.51	%18.26
Silty Clay		Soil texture

Table 2. Climatic data for the 2023 agricultural season

Solar annular radiation	Relative humidity %rate	Humidity Relativity for the %smallest	Relative % humidity	Average temperature (c)	Maximum temperatures (c)	Minimum temperatures (c)	The date
11.62	58.74	33.71	83.77	16.25	22.38	10.13	January
11.49	59.22	33.67	84.77	15.85	22.27	9.44	
12.19	52.76	20.72	84.80	11.05	18.15	3.95	February
11.88	53.74	22.17	85.30	12.88	19.81	5.95	
14.28	57.44	27.26	87.61	13.42	19.79	7.05	March
15.57	48.54	18.92	78.16	14.55	21.54	7.55	
18.54	48.49	18.63	78.34	18.58	26.56	10.61	April
17.60	51.93	22.67	81.19	19.10	26.21	11.98	
20.54	44.00	16.89	71.12	23.07	30.87	15.26	May
23.47	36.15	11.15	61.14	25.65	34.22	17.07	
22.56	32.53	11.04	54.03	29.79	38.24	21.35	June
26.81	25.81	9.13	42.48	31.44	40.10	22.78	
28.98	23.62	9.39	37.85	34.01	41.97	26.05	July
32.47	20.13	8.28	31.98	34.04	42.46	25.62	
31.96	18.18	6.58	29.79	36.50	45.01	26.92	August
31.69	20.87	6.35	35.38	36.89	46.40	25.81	
28.55	21.70	6.73	36.68	37.79	47.36	27.58	September
27.19	28.10	7.63	48.58	35.91	45.57	26.01	
26.17	22.57	8.28	36.85	34.95	44.67	26.00	October
24.73	23.79	7.25	40.34	32.15	42.21	22.92	
20.07	29.98	11.59	48.37	29.87	38.82	21.20	November

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16.19	42.29	19.44	65.14	24.43	32.38	17.48	
13.40	50.84	21.87	79.81	21.15	27.97	14.83	December
10.68	55.24	24.59	85.89	16.69	22.25	11.13	
11.42	51.02	18.32	83.71	14.47	20.66	8.29	January
10.44	54.44	22.90	85.98	14.11	20.68	7.55	

Note: Take an average of 15 days per month*.
***Climatic data were obtained from the Ministry of Agriculture / Agricultural Meteorology Center / Dhi Qar Governorate - Shatra Station / Longitude 46.19° / Latitude 31.45°**

Results and Disscussion

plant height (cm)

Level K3 offered the greatest average of 92.76 cm, without a significant difference from level K2, which averaged 91.29 cm. This is something that can be observed from the findings of Table (4) for the second mowing, which shows that the potassium treatments differed significantly in plant height characteristic. Potassium's functional properties include increasing the efficiency of the photosynthesis process and transporting its products to effective growth areas such as meristematic tissues. These properties contribute to increasing cell division and elongation, which ultimately led to an increase in plant height. Potassium's positive effect on plant height can be attributed to these functional properties. Despite the fact that the comparison treatment (which did not include any additions) recorded the lowest average growing height of 86.18 cm, the findings make it abundantly evident that potassium has a beneficial impact on the growth of plant height, (Reddy et al., 2004) and (Mengel 2007). This result agreed with what was stated by Maheshwar (2005), Ahmed et.al (2011), Inugraha et al.(2014) and Hassanain et al.(2016) who found an increase in plant height with increasing levels of potassium fertilizer.

According to the findings, the dates on which the plants were transplanted had a substantial impact on the height of the plants. Based on the findings presented in Table 3, it can be observed that the D5 date (1/30) yielded the highest average plant height of 57.55 centimeters, which was significantly higher than the average height of all the other days (D2). the dates D3 and D4, which had an average height of 52.45, 54.25, and 53.98 centimeters, respectively, while date D1 (12.1) had the lowest average plant height of 43.13 centimeters, and the results of the second mowing, which are presented in Table (4), showed that there were significant differences between the dates. In comparison to the other days, the first date, D1, had the highest average height of 104.72 centimeters, which was much higher than the other dates. On the other hand, date D5 had the lowest height of 78.68 centimeters, this may be due to the superiority of the first date D1 In the first mowing table (3) the fifth date is D5 for the second mowing, Table (4) On the rest of the dates to suit environmental conditions for normal growth and development In terms of intensity of illumination the length of the day and the temperature Compared to other dates where the temperature and low intensity of illumination And all day long (Table 2).

It was observed that there was a significant interaction between planting dates and potassium levels in the second mowing, the interaction between the first planting date and the second potassium fertilizer level (D1K2) recorded the highest average plant height of 111.4 cm it is significantly superior to all other combinations, while the combination (D5K0) gave the lowest average of 74.44 cm (Table 4).

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Table 3: Effect of potassium fertilizer levels, planting dates, and interaction Between them in plant height (cm)

The first mowing					
Average	**Potassium fertilizer levels**				**dates**
	K3	**K2**	**K1**	**K0**	
43.13	40.73	43.13	43.07	45.60	**D1**
52.45	52.00	54.80	50.93	52.07	**D2**
54.25	54.60	54.67	54.22	53.53	**D3**
53.98	54.27	53.13	54.33	54.20	**D4**
57.55	60.07	56.53	56.13	57.47	**D5**
	52.33	**52.45**	**51.74**	**52.57**	**Average**

interaction	**Potassium levels**	**dates**	**L.S.D 0.05**
N.S	N.S	4.023	

Table 4: Effect of potassium fertilizer levels, planting dates, and interaction Between them in plant height (cm)

The second mowing					
Average	**Potassium fertilizer levels**				**dates**
	K3	**K2**	**K1**	**K0**	
104.72	97.22	111.44	108.89	101.33	**D1**
94.09	103.88	93.78	91.66	87.05	**D2**
87.90	90.22	86.44	88.55	86.39	**D3**
84.86	90.00	82.55	85.22	81.67	**D4**
78.68	82.50	82.22	75.55	74.44	**D5**
	92.76	**91.29**	**89.97**	**86.18**	**Average**

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interaction	Potassium levels	dates	L.S.D 0.05
11.498	3.961	9.441	

Number of main branches in the factory(Branch.plant^{-1})

The results of Table (7) showed that the transplantation dates had a significant effect on the number of main branches of the first mowing, date D1 (1/12) and date D2 (15/12) gave the highest averages, reaching 4,800 and 3,354 branches. Plant^{-1} respectively outperforming the rest of the dates (D3, D4, and D5), which gave the smallest number of main branches, amounting to 2,938, 2,583, and 2,850 branches, plant^{-1}, respectively, perhaps the superiority of dates D1 and D2 over the rest of the dates is due to the positive effect of temperature, photoperiod, optimal relative humidity, and the relationship between them(Table 2) which pushed towards prolonging the period of branching, in addition to the fact that the conditions were conducive to increasing the efficiency of the photosynthesis process and thus increasing the production and accumulation of dry matter in the stems, which increased the plant's ability to produce branches (Khan, 2012), This is consistent with what was stated by (Abdel Hassan, 2024 and Abdel Qader, 2018), who pointed out the role of optimal environmental conditions in increasing the efficiency of photosynthesis within the plant and thus increasing the number of vegetative branches.

In addition, the findings presented in Table 7 demonstrated that there is no significant relationship between the levels of potassium and the interaction between them and the dates of transplanting on the number of major branches that are present in the plant.

Regarding the levels of potassium fertilizer, it significantly affected the number of branches (Table 8) for the second mowing, level K3 gave the highest average of 8.61 plant branches^{-1}, significantly superior to the rest of the treatments, which did not differ from treatment K2 with an average of 8.28 plant branches^{-1}, while the comparison treatment K0 gave the lowest average of 6.51 plant branches^{-1}, The reason for this could be attributed to the significant role that potassium plays in enhancing the efficiency of photosynthesis within the plant and the transfer of its products to the new parts. This, in turn, leads to an increase in the height of the plant as well as the number of stem nodes. This is because potassium promotes the growth of tissue and improves the absorption of nutrients, which is reflected in an increase in the number of stem nodes. Growth of plants in general and the vegetative branches of plants in particular, Karron et al., (1994). This result is consistent with the findings of Maniruzzaman et al., (2017), Hassanain et al., (2016), and Abbass, 2021), who provided evidence that potassium plays a role in raising the amount of branches that are produced by each plant.

It is clear from Table (8) that there are no significant differences between the dates coefficients and the two-way interaction coefficients for planting dates and potassium levels.

Table 5: Effect of potassium fertilizer levels, planting dates, and interaction Between them Number of main branches in the factory(Branch.plant^{-1})

The first mowing					
Average	Potassium fertilizer level				dates
	K3	K2	K1	K0	
4.800	5.533	4.867	4.267	4.533	**D1**
3.354	3.200	3.483	3.200	3.533	**D2**

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2.938	3.000	3.000	3.283	2.467	**D3**
2.583	2.667	2.667	2.600	2.400	**D4**
2.850	3.267	2.867	2.333	2.933	**D5**
	3.533	**3.377**	**3.137**	**3.173**	**Average**

interaction	Potassium levels	dates	L.S.D 0.05
N.S	N.S	0.5921	

Table 6: Effect of potassium fertilizer levels, planting dates, and interaction Between them Number of main branches in the factory(Branch.plant^{-1})

The second mowing					
Average	**Potassium fertilizer level**				**dates**
	K3	**K2**	**K1**	**K0**	
6.12	6.11	6.22	6.50	5.66	**D1**
6.50	6.88	6.66	6.11	6.33	**D2**
9.94	10.77	10.44	9.89	8.67	**D3**
8.03	8.94	8.17	8.36	6.66	**D4**
7.69	10.33	9.89	5.33	5.22	**D5**
	8.61	**8.28**	**7.24**	**6.51**	**Average**

interaction	Potassium levels	dates	L.S.D 0.05
N.S	1.058	N.S	

Plant leaf area (plant^{-1} dm^2)

The results showed a significant effect of planting dates on the leaf area of the plant, in the first and second mowings (Tables 5 and 6), as date D1 (1/12) gave the two highest averages of 97.0 and 217.4 dm2, in the sequence, significantly superior to All other dates, while date D4 (15/1) gave the two lowest averages in this characteristic, reaching 35.4 and 116.1 dm2, in the sequence, and without a significant difference from the fifth seedling date, D5, the reason for the superiority of the first date, D1, for both mowing may be attributed to the fact that it coincided with a relative decrease in temperature and intensity

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of solar radiation, with a noticeable increase in relative humidity (Table 2) compared to the rest of the dates, which had an effect in accelerating vital processes, which increased the leaf area, these results agreed with the findings of Maheshwar (2005) and Abdul Hassan (2024).

The results of the second mowing indicate that potassium fertilization has a significant effect on this trait. Treatment K3 gave the highest average of 194.9 dm2, which is significantly superior to all other levels. In contrast, the comparison treatment K0 gave the lowest average of 114.8 dm2 and there was no significant difference between the K1 fertilizer level and the K3 fertilizer level. The reason for the superiority of the K3 fertilizer level in the leaf area of the plant may be due to its superiority in the potassium content of the leaves(Tables 3 and 4), these results agreed with the results of Maniruzzaman et al., (2017) and Benhmimou et al., (2018).

It is clear from the results of the first mowing that there is a significant interaction between the planting dates and potassium levels, as the two combinations between the first planting date and the two potassium fertilizer treatments K1 and K3 (D1K1 and D1K3) were significantly superior to the rest of the treatments with averages of 111.5 and 99.1 dm2, in the sequence, while the treatment gave (D4K0) The lowest average was 28.0 dm2 and without a significant difference between some combinations. This result was consistent with the results obtained for the factors alone, and its interpretation is due to what was mentioned when discussing the individual factors.

Table 7: Effect of potassium fertilizer levels, planting dates, and interaction Between them In the Plant leaf area (plant^{-1} dm^{2})

The first mowing					
Average	**Potassium fertilizer levels**				**dates**
	K3	**K2**	**K1**	**K0**	
97.0	99.1	82.8	111.5	94.6	**D1**
70.8	71.9	71.7	57.9	81.7	**D2**
49.5	44.9	62.1	62.5	28.4	**D3**
35.4	46.1	32.8	34.6	28.0	**D4**
40.6	53.0	32.4	40.2	37.0	**D5**
	63.0	**56.4**	**61.3**	**53.9**	**Average**

interaction	**Potassium levels**	**dates**	**L.S.D 0.05**
19.30	N.S	10.94	

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Table 8: Effect of potassium fertilizer levels, planting dates, and interaction Between them In the Plant leaf area (plant^{-1} dm^2)

The second mowing					
Average	**Potassium fertilizer levels**				**dates**
	K3	**K2**	**K1**	**K0**	
217.4	311.4	215.9	201.7	140.5	**D1**
177.1	184.1	222.8	165.9	135.6	**D2**
152.7	180.8	161.7	160.8	107.7	**D3**
116.1	151.5	90.2	127.4	95.5	**D4**
123.5	146.9	143.2	109.1	94.9	**D5**
	194.9	**166.8**	**152.9**	**114.8**	**Average**

interaction	**Potassium levels**	**dates**	**L.S.D 0.05**
N.S	13.10	53.50	

Chlorophyll index(Spad)

It is noted from the results in for the first mowing that there was no significant effect of seedling dates or potassium levels, and the significant effect was limited to the interaction between them. However, in the second mowing, the significant effect was limited to potassium levels only.

The results in Table (7) showed that there was a significant effect of the interaction between seedling dates and potassium levels in this trait, as the combination between the fifth planting date and the level of the second potassium fertilizer (D5K2) recorded the highest average of 31.79 (spad), which did not differ significantly from the average of number Of the combinations, especially between the fifth date and different potassium levels, the increase in chlorophyll content may be attributed to the increase in the percentage of solar radiation and temperatures during the life of the first mowing, at the fifth date which means efficient use of thermal units and solar radiation, which contributed to enhancing plant growth and development and increasing the representation of materials resulting from efficient photosynthesis, which led to an increase in the chlorophyll content of the leaves (Croft et.al., 2020).

The results in Table (8) for the second mowing showed that potassium levels had a significant impact on the chlorophyll index, as the K3 level gave the highest average of 21.42 (spad), superior to all other levels. As for the lowest chlorophyll content, it was in the comparison treatment K0, which averaged 19.25 (spad).) and without a significant difference from K1 and K2, whose averages reached 19.73 and 19.81 spad, the increase in the chlorophyll content of the leaves of the plant by adding potassium can be attributed to the active and positive role of potassium in many physiological processes, such as the rate of photosynthesis and the rate of transpiration, and its stimulating and stimulating effect on a large number of enzymes, including enzymes that stimulate photosynthetic pigments, which helps improve plant growth. In addition, the role that potassium plays in encouraging the roots to absorb nitrogen from the soil solution, which is involved in the synthesis of chlorophyll, which increases the chlorophyll content of the leaves (Inugraha, 2014), these results agreed with what was stated by (Lei et at., (2011),

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who indicated that the chlorophyll content in stevia leaves increases with the increase in the level of potassium, from the same table it is clear that the differences did not rise to the level of significance in planting dates for this trait, nor did the differences rise to the level of significance. At the level of significance for the bilateral interaction between transplanting dates and potassium levels in this trait.

Table 9: Effect of potassium fertilizer levels, planting dates, and interaction Between them in The Chlorophyll index(Spad)

The first mowing					
Average	**Potassium fertilizer level**				**dates**
	K3	**K2**	**K1**	**K0**	
29.15	25.79	28.37	30.69	31.76	**D1**
28.96	28.59	27.93	30.45	28.86	**D2**
29.48	29.22	30.16	30.03	28.53	**D3**
28.80	27.72	29.80	28.46	29.23	**D4**
31.49	31.74	31.79	31.23	31.18	**D5**
	28.61	**29.61**	**30.17**	**29.91**	**Average**
interaction		**Potassium levels**	**dates**		**L.S.D 0.05**
N.S		N.S	1.149		

Table 10 : Effect of potassium fertilizer levels, planting dates, and interaction Between them in The Chlorophyll index(Spad)

The second mowing					
Average	**Potassium fertilizer level**				**dates**
	K3	**K2**	**K1**	**K0**	
19.89	20.65	20.67	19.89	18.34	**D1**
20.45	21.90	20.57	20.40	18.95	**D2**
20.10	22.04	18.73	19.24	20.41	**D3**
18.33	18.55	18.11	18.28	18.40	**D4**

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21.48	23.98	20.97	20.84	20.12	**D5**
	21.42	**19.81**	**19.73**	**19.25**	**Average**
interaction		**Potassium levels**	**dates**		**L.S.D 0.05**
N.S		1.240	N.S		

Total yield of dry leaves (mega grams ha^{-1})

The results of Table (9) showed a significant effect of seedling dates on the average total yield of dry leaves and the interaction between them and potassium levels, while there was no significant effect on potassium levels.

The results showed that the seedling dates had a significant effect on the total yield of dry leaves, as the date D1 (1/12) gave the highest average, amounting to 25.81 megagrams.ha^{-1}, and without a significant difference from the second date, D2 (15/12), which averaged 25.02. meg.ha^{-1} in the sequence, while date D4 (15/1) gave the lowest average of 13.56 meg. hectare^{-1}.

It was observed that there was a significant interaction between the planting dates and potassium levels, as the two combinations between the first planting date and the K2 fertilizer treatment (D1K2) and the second planting date and the K0 potassium fertilizer treatment (D1K0) were significantly superior to the rest of the treatments, with averages reaching 28.76 and 28.94 micrograms. hectare^{-1} in the sequence and without a significant difference from a number of combinations, while the combination (D5K0) gave the lowest average of 11.83 megagrams. hectare^{-1}, the reason for the superiority of date D1 over the rest of the date and combinations (D1K2 and D1K0) is due to its superiority in paper space (Tables 5 and 6) which worked to increase the total yield of leaves in the plant.

Table 11: Effect of potassium fertilizer levels, planting dates, and interaction Between them in the Total yield of dry leaves (mega grams ha-1)

Average	**Potassium fertilizer level**				**dates**
	K3	**K2**	**K1**	**K0**	
25.81	24.72	28.76	28.06	21.70	**D1**
25.02	23.28	28.13	19.72	28.94	**D2**
22.71	24.47	23.80	21.47	21.10	**D3**
13.56	12.47	13.65	15.13	13.01	**D4**
14.37	16.98	15.72	12.93	11.83	**D5**
	20.38	**22.01**	**19.46**	**19.31**	**Average**
interaction		**Potassium levels**	**dates**		**L.S.D 0.05**
283.8		N.S	154.2		

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Rebaudioside A content of dried leaves (µg/g)

The results of tables (12 and 13) showed that there was a significant effect of important factors on the content of dried roots of Rebaudioside A, and there was no significant effect of planting dates, interaction, and variety only on this trait.

It was noted from the results that potassium levels significantly affected the content of dried leaves of Rebaudioside A, as stevia plants gave the two highest concentrations of Rebaudioside A at the K3 level, reaching 136.65 and 132.35 micrograms/g for both mowings, in the sequence, significantly superior to the rest of the levels, whose averages began to decrease significantly. Significantly, with a decrease in the amount of added potassium, reaching the maximum decrease with the control treatment K0 (without addition), which averaged 125.30 and 120.61 micrograms/gram for the two packages, in the sequence, perhaps the reason for the superior level of K3 fertilizer is due to the important role of potassium in photosynthesis processes that increase the chlorophyll content, as the chlorophyll pigment, which is found in chloroplasts, has an important role in the biochemical processes that the stevia plant requires for the purpose of increasing the production of Rebaudioside A in the leaves. This compound is one of the Components of steviol glycosides that are manufactured in plant tissues containing chloroplasts (Al-Hasani, 2021 and Mahdi, 2023). This result is consistent with the findings of (Benhmimou et al., 2018, Pall et al., 2015, and Aladakatti et al., 2012) who indicated that Rebaudioside A was gradually increased by increasing the levels of potassium fertilizers. These results also agreed with (Gatie et al., 2021) in obtaining The highest percentage of Rebaudioside A is obtained when spraying potassium on the stevia plant.

Table 12: Effect of potassium fertilizer levels, planting dates, and interaction Between them in the Rebaudioside A content of dried leaves (µg/g)

The first mowing					
Average	**Potassium fertilizer level**				**dates**
	K3	**K2**	**K1**	**K0**	
129.22	134.70	130.88	126.80	124.51	**D1**
130.11	135.88	131.80	127.88	124.88	**D2**
130.46	136.14	132.44	128.14	125.12	**D3**
132.12	138.75	133.50	130.25	126.00	**D4**
131.12	137.80	134.32	129.66	125.98	**D5**
	136.65	**132.59**	**128.55**	**125.30**	**Average**

interaction	**Potassium levels**	**dates**	**L.S.D 0.05**
N.S	1.650	N.S	

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Table 13: Effect of potassium fertilizer levels, planting dates, and interaction Between them in the Rebaudioside A content of dried leaves (µg/g)

The second mowing					
Average	**Potassium fertilizer level**				**dates**
	K3	**K2**	**K1**	**K0**	
124.90	130.55	126.88	122.05	120.14	**D1**
125.66	131.25	127.41	123.65	120.33	**D2**
126.51	132.58	128.06	124.80	120.58	**D3**
127.92	134.12	129.88	126.45	121.22	**D4**
127.32	133.25	130.21	125.01	120.80	**D5**
	132.35	**128.49**	**124.39**	**120.61**	**Average**

interaction	**Potassium levels**	**dates**	**L.S.D 0.05**
N.S	1.795	N.S	

Conclusion

In the view of the results obtained from the present study, the following can be concluded:

1- Potassium fertilizer improved most growth indicators compared to the control treatment and the level of K3 fertilizer (75 kg potassium ha-1) recorded a noticeable increase in all the traits studied.
2- The results of our study showed the success of growing the stevia crop in the open field, and the first date (1/12) recorded a noticeable increase in most of the studied traits of the plant.
3- The interactions between the studied factors showed a significant effect on most traits. The combined treatment outperformed D1K1 (25 kg potassium h-1 with the first date D1 1/12), D5K2 (50 kg potassium ha-1, and D5K2 (50 kg potassium ha-1). Fifth D5 30/1) and D4K3 (75 kg potassium H-1 and fourth date D4 15/1) in leaf area, chlorophyll index, , and total dry leaf yield, which amounted to 111.5 plant fat-1, 31.79 spores, and 28.94 µg/h-1 for the first mowing in the sequence.

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