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RESEARCH ARTICLE

Effects of row spacing and selective herbicides on growth, yield, quality and associated weeds in sugarcane

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Abstract

In order to reduce the effects of salinity and increase land Two field experiments were carried out at Shandaweel Agricultural Research Station (latitude of 26 33° N and longitude of 31 41°E), Sohag Governorate, Egypt in 2023/2024 and 2024/2025 seasons to study the effect of some integrated weed control treatments, rows pacing (80, 100 and 120 cm) and some treatments; Hoeing, Unweeded, Stomp, Dinamic, Steler star and Lumax herbicides on quality and yield of sugarcane G.2004-27 variety (Giza-4).

A randomized complete block designs in a split-plot arrangement with three replications was used.

Results revealed that growing sugarcane in rows spaced at 80-cm apart resulted in a significant increase in, number of millable canes/fed, stalk diameter and stalk fresh weight were produced by 120-cm. Row spacing 100-cm increased stalk height, brix%, sucrose%, purity%, sugar recovery%, cane and sugar yields/fed.

The applied herbicides and hoeing (twice) negatively and significantly affected dry weight of both grassy and broad-leaved weeds and their total weight, compared to un-weeded plots. The applied herbicides and hoeing appreciably increased growth attributes, juice quality, cane and sugar yields/fed. Dinamic herbicide (pre-emergence) and/or hoeing were the most effective in weed eradication, resulting in higher sugarcane traits, compared with the other treatments.

The effects of interactions among the studied factors on sugarcane and/or weed traits were discussed. Under conditions of the present study, growing sugarcane, in rows spaced at 100-cm and controlling accompanied weeds by Dinamic herbicide (750 g/fed) pre-emergence and/or hoeing twice, can be recommended for getting the highest cane and sugar yields/fed and highest values of net income and profitability%.

Keywords: Row space; Weed control; Herbicides; Hand hoeing; Sugarcane

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Introduction

Sugarcane is important cash and industrial crop in Egypt, occupying 316 thousand feddan, production is estimated at 14.006 million tons of cane with an average yield of 45.258 ton/fed from which 642166 tons of sugar were obtained Sugar Crops Council, annual report, (2024).

Row spacing has a direct effect on plant population. It plays a distinct role in the amount of solar radiation intercepted and density, hence, crop canopy development which in turn affects photosynthesis and ultimately the dry matter produced by Chang, (1974), and might affect weed population inside sugarcane fields. Also, it may affect cane diameter, length and weight which contribute to cane yields. Khan, et al. (2003) resulted that the weed population (4.16 weed m2) in the triple row strips at 120 cm was significantly less than the weed population in the other geometry used in this study. El-Shafai, et al. (2010) found that growing sugarcane in rows spaced at 80-cm apart resulted in a significant increase in stalk height, number of millable canes, cane and sugar yields/fed. The thickest cane stalks were produced from plants grown at 120cm. Row spacing rows at 100 cm gave the highest values of brix, sucrose, juice purity and sugar recovery percentages. Abd El-Lattief (2016) found that narrow inter-row spacing 100 cm produced higher number of millable canes, cane and sugar yields compared to the other inter-row spacing 120 and 140 cm. Galal, et al. (2018) indicated that planting sugarcane in rows spaced at 100 cm attained significant increases in the number of millable canes, stalk length, stalk weight, sucrose %, sugar recovery %, cane and sugar yields. Gadallah and Abd El-Aziz (2019) showed that planting sugarcane in rows spaced at 100 cm apart attained a significant increase in stalk height, number of millable canes and cane yield. While, stalk diameter, brix, sucrose and sugar recovery% as well as sugar yield were recorded surpassed the other varieties recorded at 120 cm row spacing. Ali, et al. (2024) showed that row spacing significantly on stalk height, diameter and number of

millable canes/fed, stalk weight kg/plant, cane and sugar yields (tons/fed) as well as brix, sucrose, purity and sugar recovery percentages. There are many methods for controlling weeds including mechanical and chemical control, which are the most common methods for controlling weeds, including mechanical and chemical control, which are the most common methods for controlling weeds growing in sugarcane fields in Egypt, due to the small size of agricultural holdings. In Egypt, the method of eradicating weeds in fields using chemical herbicides is the easiest and cheapest method of weed control due to the high cost of manual labor. Generally, the increase in weed growth corresponds to a reduction in crop due to the competition with crop plants for growth factors as water, solar radiation and nutrients. Hence, weed control in sugarcane field in the early stage becomes of a paramount importance to decease their population density and growth, duration of weed infestation as well as their competing ability with crop plants.

In this respect, El-Shafai, et al. (2010) showed that practicing hand hoeing three times at 25, 45 and 65 DAP to get rid of weeds associated to sugarcane plants resulted in a reduction in weed weight/m^2 as well as highest values of the studied traits, while the un-weeded plots gave the lowest ones. Galal, et al. (2015) stated that hand hoeing twice at 30 and 60 DAP reduced the dry weight of the annual broad-leaved weed called Morning-glory (ipomeae spp.) associated to cane plants and gave the highest values of stalk height and diameter, brix, sucrose and sugar recovery percentages as well as number of millable canes, cane and sugar yields. Fakkar, et al. (2017) showed that the most effective treatment in eliminating both grassy and broadleaved weeds was hand hoeing three times and led to increases in stalk height, number of millable canes, cane and sugar yields/fed. Gadallah and Abd El-Kareem (2020) inducted that hand hoeing and/or use of Lomax herbicide was the most effective in weed eradication, resulting in higher sugarcane traits, compared with the other treatments.

As for the use of herbicides to eliminate weeds accompanying sugarcane, Mobarak, et al. (2019) found that treatment sugarcane by (Garlone + Ready Peck herbicides) post-planting and/or Ready Peck herbicide pre-emergence alone reduced weed weight of total annual weeds and gave the best value for height, diameter, weight of millable cane and juice quality as well as cane and sugar yields/fed compared with un-weeded check. Likewise, Mohamed and Marzouk (2019) reported that all the tested herbicides and hand hoeing significantly had high weed control efficiency, which resulted in the highest increase in sugarcane growth, yield and quality of over untreated control. Among the tested herbicidal treatments, Lumax, Garlon and Starane showed maximum herbicidal activity against broad-leaved weeds.

The aim of the present work was to find out the best row spacing and effective weed control treatment to obtain the highest yield and quality of sugarcane.

Materials and methods

Two field experiments were carried out at Shandaweel Agricultural Research Station (latitude of 26 33° N, longitude of 31 41°E and altitude of 69 m), Sohag Governorate, in 2023/2024 and 2024/2025 seasons to study the effect of row spacing of sugarcane and some weed control treatments on growth, quality and yield of sugarcane. Sugarcane variety namely G. 2004-27 (Giza-4) was used as a planting material. Randomized complete block designs in a split-plot arrangement with three replications were used. Row spacing was allocated in the main plots, while weed control treatments were randomly distributed in the sub plots.

The sub-plot area was 60 m^2, including 15, 12 and 10 rows of 5 m in length, in case of spacing at 80, 100 and 120 cm, respectively. Two rows of three-budded cane cuttings were used. Sugarcane was planted in the 1st week of March in both seasons, and harvested after 12 months, in both seasons. Phosphorus fertilizer as calcium super phosphate (15% P_2O_5) was added once during seed bed preparation at the rate 30 kg P_2O_5/fed. Nitrogen fertilizer was applied at 210 kg N/fed as urea (46% N) which was split into two equal doses; after the1st and 2nd hoeing, i.e. (30 and 60 days from planting). Potassium fertilizer was added once as potassium sulfate (48% K_2O) with the 2nd dose of N fertilizer at the rate of 48 kg K_2O/fed. Spraying of herbicides was done using CP_3 knapsack sprayers fitted with AN 2.5 nozzles at 20-bar pressure in 200 liters of water/fed. The other agricultural operations were practiced as recommended by Sugar Crops Research Institute. Soil chemical and mechanical analysis of the experimental site showed that the upper 30-cm of the soil was clay loam, which contained was sand clay loam (21.5 and 21.7% sand), (29.3 and 28.8 % silt) and (49.2 and 49.5 % clay), and contained (N: 94 and 110), (P: 18 and 19) and (K: 117 and 150) ppm available N, P, K with pH 7.55 and 7.60, in the 1st and 2nd seasons, respectively.

The following weed control treatments were applied

1. Pendimethalin (Stomp 48%EC) was applied as pre-emergence of cane plant (after seed bed preparation and before irrigation, at rate of 1.75 l/fed.

2. Amicarbazone (Dinamic70% WP) was applied as pre-emergence at rate of 750 g/fed.

3. Methanon (Steler star 21 % SL) was applied 15 days as post-emergence of cane plant at rate of 300 cm3/fed
4. Mesotrione (Lumax 15% SC) was applied as pre-emergence at rate of 1.7 l/fed.

5. Mesotrione (Lumax 15% SC) was applied 15 days as post-emergence of cane plant at rate of 1.7 l/fed
6. Amicarbazone (Dinamic 48% EC)) was applied 15 days as post-emergence of cane plant at rate of 1.7 l/fed.
7. Hand hoeing twice, 30 and 60 days after planting (DAP).
8. Un-weeded treatment (control).

Table 1. Tread, common, chemical name and chemical family as well as mode of action, rate and time of application in 2023/2024 and 2024/2025 seasons

Tread name	Common name	Chemical name	Chemical family	Mode of action	Rate of application	Time of application
Stomp 48% EC	Pendimethalin	-N-(1-ethylpropyl) dimethyl-2,6--3,4 dinitrobenzenamine	Dinitroaniline	Microtubule assembly inhibition and Selective .inhibition roots growth herbicide can be absorbed by roots and leaves. Affected plants die shortly after germination or .following emergence from the soil	1.75 l/fed.	sprayed as pre-emergence
Dinamic 70% WP	Amicarbazone	amino-N-(1,1-imethylethyl)-4,5-dihydro-3-(1-ethylethyl)-5-oxo-1H-1,2,4-trizole-1-carboxamide	Triazolinone	PPO inhibition	750 g/fed.	sprayed as pre-emergence
Steler star21 % SL	Methanone	dihydro-3-isoxazolyl)-2--5‹4)-(3 methyl-4- ethylsulfonyl) phenyl](5-[hydroxy-1-methyl-1H-pyrazol-4-yl	Netrazole	A Novel Inhibitor of the Molecular Chaperone Hsp90 by Fragment Based Drug Design	300cm3/fed	Post-emergence
Lumax 15% SC	Mesotrione	[2-4-(methanesulfonyl)-nitrobenzoyl]Cyclohexane-1, 3-dione	. Benzoylcyclohexanedione.	Involves inhibiting the HPPD enzyme, which is crucial in the carotenoid biosynthesis pathway in plants. This inhibition disrupts the plant's ability to produce carotenoids, leading to their bleaching and eventual death	1.7 l/fed.	sprayed as pre-emergence
Hand hoeing	-	-	-	-	twice	30 and 60days after planting
Unweeded treatment	-	-	-	-	-	-

Table 2. Scientific name, English name and Family for weeds accompanied sugarcane in the experimental site during 2023/2024 and 2024/2025 seasons

Weeds type	Scientific name	English name	Family
Grassy weeds	*Echinochola colonum L.*	Jungle rice	Poaceae
Broad-leaved	*Amaranthushybridus L.*	Pig weed	Amaranthaceae
	Corchorus olitorius L.	Malta jute	Tilaceae
	Daturas tramomium L.	Jimsonweed	Solancaceae
	Euphorbia peplus L.	Leafy spurge	Euphorbiaceae
	Portulacao leracea L.	Common puslane	Protulaceceae
	Xanthium spinosum L.	Cocklebar	Asteraceae

Recorded data

Weed measurements

Weeds from one m^2 in each sub-plot were pulled out after 45 and 60 days from spraying, separated to grassy and broad-leaved weeds and air dried for seven days then oven dried at 70 C° until a constant weight to record the following items:

1. Dry weight of grassy weeds/m^2 (g). at 45 and 60 days after spraying (DAS).
2. Dry weight of broad leaf weeds/m^2 (g) at 45 and 60 DAS.
3. Total dry weeds/m^2 (g) at 45 and 60 DAS.

Sugarcane traits

The following data were recorded at harvest:

1. Stalk height (cm).
2. Stalk diameter (cm).
3. Net-stalk fresh weight (kg).
4. Number of millable canes/ sub-plot was counted and converted into thousands/fed.

A sample of 20 millable canes represent each treatment was taken at random, cleaned and crushed to extract the juice, which was analyzed to determine the following quality traits:

1. Brix% (total soluble solids) was determined using "Brix Hydrometer" according to the method described by "The Chemical Control Lab" of Sugar and Integrated Industries Company Anonymous, (1981).
2. Sucrose% was determined using "Sacharemeter" according to A.O.A.C. (2005).
3. Purity percentage was calculated according to the following equation:

Purity % = sucrose % / brix % x 100

4. Sugar recovery% was calculated according to Yadav and Sharma (1980) as follows:

Sugar recovery % = [sucrose % - 0.4 (brix% - sucrose %) × 0.73].

Where

The harvested sugarcanes of the middle three rows of each sub-plot were cut, topped, cleaned up from trash and weighed and counted to estimate the following traits:

1. Cane yield/fed (ton/fed), which was determined from the fresh weight (kg) of millable canes of each sub-plot, which was converted into tons/fed.
2. Sugar yield/fed (ton/fed), which was estimated according to the following equation:

Sugar yield/fed (ton/fed), = cane yield/fed (ton/fed), x sugar recovery%/100.

Economic evaluation

Economic evaluation for the results was done to investigate the variations among the different studied combinations to get the highest profitability using some economic criteria. Economic criteria were calculated according to the following formulae described by Buckett (1981).

1. Gross income (total revenue of cane yield) was calculated as formulas:

Gross income = cane yield (ton/fed) x price of one ton.

2. Net income (NI) = Gross income (GI) – Total costs (TC).
3. Profitability % = NI/TC x 100.

Statistical analysis

Collected data were subjected to the proper analysis of variance (ANOVA). The proper statistical of all data was carried out according to Gomez and Gomez (1984). Homogeneity of variance and differences among treatments were evaluated by the least significant difference test (LSD) at 5%.

Results and Discussion

Effect of row spacing

Dry weight of weeds (g/m^2)

Data in Table (3) showed that planting sugarcane in rows pacing by of 80, 100 and 120-cm did not show significant differences in dry weight of grassy and broad-leaved as well as total weeds at 45 and 60 days after spraying (DAS) in both seasons

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Table 3. Dry weight of weeds (g/m^2), as affected by row spacing at 45 and 60 DAS in 2023/2024 and 2024/2025 seasons

Row spacing (A) cm	Dry weight of weeds (g/m^2)											
	Grassy-leaved weeds at 45 DAS		Broad-leaved weeds at 45 DAS		Total weeds at 45 DAS		Grassy-leaved weeds at 60 DAS		Broad-leaved weeds at 60 DAS		Total weeds at 60 DAS	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
80	58.63	48.83	96.50	84.21	156.63	133.04	53.92	75.04	95.58	106.17	149.50	180.79
100	58.63	51.83	93.21	82.13	151.83	133.96	56.92	71.96	109.08	115.71	166.00	187.67
120	60.54	53.75	95.42	88.50	155.96	142.25	60.25	74.96	108.42	116.83	168.67	191.79
LSD at 0.05	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Growth attributes

Upon analyzing the data in Table (4), we noticed that increasing row spacing led to a significant decrease in number of millable canes/fed as well as an appreciable increase in stalk diameter and Net-stalk fresh weight. However, row space of 100 cm led to an increase stalk length in the 1st and 2nd seasons. Chang, (1974) reported that the proportion of invisible solar radiation is so much increased than the visible solar radiation due to dense sowing. The former has an elongation effect and hence accounts for the increase observed in stalk height when sugarcane was planted in close spaced rows. The same finding was reported by Abd El-Lattief (2016) and Gadallah and Abd El-Aziz (2019). These results by El-Shafai and Ismail (2006) that the widest row distances significantly gave the thickest stalks when he planted sugarcane in row distances of 80, 100 and 120cm. Moreover, the reduction in the number of millable canes/fed accompanying the increase in the distance between cane rows could be attributed to that widening distance between rows decreased the density of planted seeds (cane cuttings). This result is in agreement with those mentioned by El-Geddawy, et al. (2002).

Table 4. Growth parameters of sugarcane as affected by row spacing in 2023/2024 and 2024/2025 seasons

Row Spacing (A) Cm	Stalk length (cm)		Stalk diameter (cm)		No. of millable cane (1000/fed		Net-stalk fresh weight(kg)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
80	283.83	280.79	2.40	2.40	43.927	44.617	1.172	1.187
100	289.63	283.42	2.46	2.43	42.364	42.957	1.265	1.266
120	271.92	272.46	2.51	2.46	38.880	39.524	1.302	1.298
LSD at 0.05	**3.94**	**1.93**	**0.03**	**0.05**	**0.676**	**0.859**	**0.004**	**0.010**

Quality characteristics

The results in Table (5) indicated that brix, sucrose, purity and sugar recovery percentages were significantly affected by row spacing of sugarcane in the 1st and 2nd seasons. The results showed that spacing rows of sugarcane at 100 cm resulted in the highest values of brix sucrose, purity and sugar recovery percentages, while the lowest of the four quality traits, were recorded by cane stalks grown in rows of 80 cm apart, in both seasons.

These results may be attributed to the intense competition among plants for light and nutrients, as well as to mutual shading, which occurs when cane is planted at 100 cm row spacing, compared to 80 or 120 cm row spacing. Solar radiation affects both Brix and sucrose content Chang, (1974). These results are in agreement with those reported by El-Shafai, et al. (2010) and Galal, et al. (2018).

Table 5. Quality juice characteristics of sugarcane as affected by row spacing in 2023/2024 and 2024/2025 seasons

Row Spacing (A) cm	Brix %		Sucrose %		Purity %		Sugar recovery %	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
80	20.21	19.67	15.60	15.19	83.14	83.10	10.38	10.10
100	20.67	20.76	16.00	16.04	83.56	83.42	10.70	10.71
120	20.42	20.45	15.74	15.80	83.30	83.35	10.49	10.54
LSD at 0.05	**0.27**	**0.19**	**0.22**	**0.16**	**0.19**	**0.21**	**0.16**	**0.12**

Cane and sugar yields (ton/fed)

Data in Table (6) showed that cane yield was significantly affected by row spacing in both seasons. The results pointed out that growing sugarcane in rows of 100-cm apart increased 2.147 and 2.944 ton of canes/fed and 0.393 and 0.435 ton of sugar/fed higher than that obtained by planting it in rows spaced at 80 and 120 cm, in the 1st season, respectively corresponding to 1.233 and 2.883 ton cane/fed and 0.474 and 0.397 ton of sugar/fed, in the 2nd one. The increase in cane yield is due to the increase in both stalk length, net-stalk fresh weight and number of millable canes/fed achieved when planting sugarcane at100-cm row spacing (Table 4). The increase in sugar yield/fed was associated with the increase in brix, sucrose and sugar recovery% as well as cane yield/fed (Tables 5 and 6), which is considered the main component of sugar yield. These results are in agreement with those reported by El-Shafai and Ismail (2006).

Table 6. Cane and sugar yields of sugarcane as affected by row spacing in 2023/2024 and 2024/2025 seasons

Row Spacing (A) Cm	Cane yield (tone/fed)		Sugar yield (tone/fed)	
	1st season	2nd season	1st season	2nd season
80	52.462	54.141	5.490	5.543
100	54.609	55.374	5.883	6.017
120	51.615	52.491	5.448	5.620
LSD at 0.05	**0.780**	**0.742**	**0.138**	**0.102**

Effect of weed control treatments

Dry weight of weeds (g/m^2)

The effect of weed control treatments on dry weight (g/m^2) of grassy, broad-leaved and total weeds growth with sugarcane plants at 45 and 60 days after spraying (DAS) are presented in Table (7). The results manifested that controlling weeds using herbicides and hoeing affected significantly on the dray weight of broad-leaved, grassy leaved weeds and total weeds in both seasons. Using herbicide Dinamic 70% WP by rate 0.75 kg/fed pre-emergence resulted the lowest values previously mentioned both broad and grassy-leaved weds and total weeds weight after 45 and 60 days after sowing in both seasons. The highest values of weed traits were recorded in the un-weeded treatments .The other treatments ranked in between in 2023/2024 and 2024/2025 seasons. These results are also in harmony with those reported by Fakkar, et al. (2009); El-Shafai, et al. (2010); Galal, et al. (2015); Fakkar, et al. (2017); Mobarak, et al. (2019) and Mohamed and Marzouk (2019).

Table 7. Dry weight of weeds (g/m^2), as affected by weed control treatments at 45 and 60 DAS in 2023/2024 and 2024/2025 seasons

Weeds control treatments (B)	Dry weight of weeds (g/m^2)											
	Grassy weeds at 45 DAS		Broad weeds at 45 DAS		Total weeds at 45 DAS		Grassy weeds at 60 DAS		Broad weeds at 60 DAS		Total weeds at 60 DAS	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Stomp (pre-emergence) 48%	24.33	16.56	40.78	31.00	65.11	47.56	18.00	37.44	36.22	46.00	54.22	83.44
Dinamic (pre-emergence)70%	16.22	11.56	29.44	25.56	45.67	37.11	13.33	21.56	25.89	38.11	39.22	59.67
Steler star (post-emergence) 21%	30.89	17.00	35.11	31.67	66.00	48.67	19.78	39.22	35.78	41.11	55.56	80.33
Lomax (pre-emergence) 15%	20.89	17.78	38.00	29.44	58.89	47.22	20.33	30.89	34.11	41.56	54.44	72.44
Lomax(post-emergence) 15%	27.89	16.44	29.78	29.33	57.68	45.78	21.00	36.11	37.89	38.11	58.89	73.11
Dinamic (post-emergence) 48%	30.33	18.78	43.67	35.67	74.00	54.44	22.22	38.22	48.00	61.00	70.22	99.22
Hand hoeing twice	32.67	18.11	47.44	36.78	80.11	54.89	19.67	32.33	43.11	49.22	62.78	81.56
Unweeded treatment	290.89	295.56	496.11	460.11	791.00	755.67	321.89	356.11	573.89	588.11	895.78	944.22
LSD at 0.05	**1.51**	**7.81**	**15.80**	**17.08**	**21.05**	**18.10**	**5.14**	**16.75**	**15.63**	**11.81**	**18.35**	**16.25**

Growth parameters

The results in Table (8) pointed that growth parameters i.e., stalk length, diameter, Net-stalk fresh weight (g) and number of millable cane/fed was significantly affected by the used weed control treatments (herbicides and hoeing) in both seasons. The highest values of stalk length, diameter, Net-stalk fresh weight and their number/fed were obtained by using herbicide Dinamic70% WP by rate 0.75 kg/fed pre-emergence, followed by hand hoeing twice, to get rid of the associated weeds with sugarcane, probably due to the reduction in weed population, growth and hence their competition with cane plants on the growth factors as solar radiation, water and nutrients. Although, treating weeds with Dinamic70%WP post-emergence gave lower values of stalk length, diameter and number of millable cane/fed, compared to other herbicides used in this study experiment. This result may be due to the fact that using Dinamic 70%WP post-emergence has harmful effects on growth and thus affects length, diameter and number of stalks. On the contrary, the lowest values of sugarcane traits were recorded in the un-weeded plots due to the severe competition of weeds with sugarcane plants. These results are in agreement with those found by El-Shafai, et al. (2010); Fakkar, et al. (2017); Gadallah and Abd-El-Kareem (2020); Mobarak, et al. (2019) and Mohamed and Marzouk (2019).

Table 8. Growth parameters of sugar cane as affected by weed control treatments in 2023/2024 and 2024/2025 seasons

Treatments (B)	Stalk length (cm)		Stalk diameter (cm)		No. of millable cane (1000/fed)		Net-Stalk fresh weight (kg)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Stomp (pre-emergence) 48%	296.87	291.33	2.55	2.52	43.947	44.913	1.296	1.305
Dinamic (pre-emergence)70%	301.33	307.44	2.59	2.57	44.839	46.219	1.317	1.328
Steler star (post-emergence) 21%	294.44	286.67	2.55	2.55	44.057	44.853	1.299	1.280
Lomax (pre-emergence) 15%	298.44	294.56	2.57	2.54	44.117	45.201	1.304	1.323
Lomax(post-emergence) 15%	296.89	291.33	2.57	2.55	44.079	44.574	1.304	1.311
Dinamic (post-emergence) 48%	291.67	280.56	2.54	2.52	42.893	42.883	1.306	1.303
Hand hoeing twice	301.56	302.33	2.59	2.56	44.784	46.053	1.316	1.330
Unweeded treatment	173.22	176.89	1.68	1.62	25.073	24.232	0.831	0.824
LSD at 0.05	**3.19**	**2.78**	**0.04**	**0.03**	**0.509**	**0.696**	**0.008**	**0.012**

Quality characteristics

The results in Table (9) revealed that the applied herbicides and hoeing treatments had significant effects on brix, sucrose, purity and sugar recovery percentages in both seasons. It was found that using herbicide Dinamic70% WP by rate 0.75 kg/fed pre-emergence was the most effective treatment in eradicating weeds accompanied to sugarcane, which insured the best growth conditions free of weed competition with cane plants, which was positively reflected on more photosynthesis and sugar accumulation in stalks. This resulted in getting the highest values of the four traits, followed by application of Stomp 70% EC herbicide pre-emergence and practicing hand hoeing twice without any significant difference between them. On the contrary, the lowest values of the studied quality characteristics were given by cane plants suffered from being grown among severe competition with weeds left to grow without any control. These results are in line with those stated by El-Shafai, et al. (2010); Fakkar, et al. (2017); Gadallah and Abd-El-Kareem (2020); Mobarak, et al. (2019) and Mohamed and Marzouk (2019). Meanwhile, insignificant differences were found between Dinamic 70% WP (pre-emergence), Lumax 15% SC (pre-emergence), Stomp 48% EC (pre-emergence), Steler star 21% SL (post-emergence) herbicides and hand hoeing in their influence on these juice quality traits, in both seasons.

Table 9. Quality characteristics of sugar cane as affected by weed control treatments in 2023/2024 and 2024/2025 seasons

Treatments (B)	Brix %		Sucrose %		Purity %		Sugar recovery %	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Stomp (pre-emergence) 48%	20.76	20.60	16.05	15.93	83.53	83.51	10.73	10.65
Dinamic (pre-emergence)70%	20.94	21.13	16.19	16.32	83.54	83.55	10.82	10.91
Steler star (post-emergence) 21%	20.68	20.39	15.97	15.77	83.40	83.38	10.66	10.52
Lomax (pre-emergence) 15%	20.68	20.85	15.98	16.13	83.44	83.61	10.67	10.79
Lomax(post-emergence) 15%	20.51	20.65	15.84	15.95	83.33	83.38	10.56	10.64
Dinamic (post-emergence) 48%	20.28	20.25	15.57	15.70	83.30	83.56	10.38	10.50
Hand hoeing twice	20.73	20.93	16.03	16.18	83.52	83.54	10.71	10.81
Unweeded treatment	18.91	17.52	14.58	13.42	81.61	81.78	9.64	8.79
LSD at 0.05	**0.34**	**0.24**	**0.22**	**0.18**	**0.21**	**0.17**	**0.19**	**0.13**

Cane and sugar yields (ton/fed)

The results in Table (10) pointed to a significant response of cane and sugar yields /fed due to the applied weed control treatments (herbicides and hoeing) in both seasons. Using herbicide Dinamic70% WP by rate 0.75 kg/fed pre-emergence to eradicate weeds resulted in increases in cane and sugar yields/fed amounted to (38.155 and 41.356.01 tons cane/fed) and (4.375 and 4.943 ton of sugar/fed) higher than that obtained by in the 1st and 2nd season, respectively, compared with un-weeding. These results manifested the importance of herbicide Dinamic70% WP by rate 0.75 kg/fed pre-emergence followed by hand hoeing twice treatment as an effective means in getting rid of weeds compete with sugarcane plants. Controlling weeds with Stomp 48% EC (pre-emergence), Steler star 21% SL (post-emergence), Lumax 15% SC (pre-emergence) and Lumax15% SC (post-emergence) herbicides increased cane yield by (36.035, 36.307, 36.609 and 36.550 tons cane/fed) and (4.093, 4.081, 4.121and 4.053 tons sugar/fed), in the 1st season, respectively corresponding to (38.504, 37.427, 39.755 and 38.357 tons/fed) and (4.478, 4.034, 4.691 and 4.451 tons sugar/fed), in the 2nd one, successively, compared with the un-weeded plots. These results are in line with those given by Fakkar, et al. (2017); Gadallah and Abd-El-Kareem (2020); Mobarak, et al. (2019) and Mohamed and Marzouk (2019). Although, treating weeds with Dinamic70%WP post-emergence gave lower values of yields characters, compared to other herbicides used in this study experiment. This result may be due to the fact that using Dinamic 70%WP post-emergence has an effect on growth (length and diameter stalk as well as number of millable canes/fed) and thus affect cane and sugar yields.

Table 10. Cane and sugar yields (ton/fed) at harvest, as affected by weed control treatments in 2023/2024 and 2024/2025 seasons

Treatments (B)	Cane yield (tone/fed)		Sugar yield (tone/fed)	
	1st season	2nd season	1st season	2nd season
Stomp (pre-emergence) 48%	56.839	58.504	6.098	6.230
Dinamic (pre-emergence)70%	58.959	61.300	6.380	6.686
Steler star (post-emergence) 21%	57.111	57.371	6.086	6.034
Lomax (pre-emergence) 15%	57.413	59.699	6.126	6.443
Lomax(post-emergence) 15%	57.354	58.301	6.058	6.203
Dinamic (post-emergence) 48%	55.853	55.756	5.796	5.853
Hand hoeing twice	58.827	61.140	6. 304	6.611
Unweeded treatment	20.804	19.944	2.005	1.752
LSD at 0.05	**0.569**	**0.734**	**0.090**	**0.101**

Effect of interaction between row spacing and weeds treatments on

Dry weight of weeds (g/m^2)

Data in Table (11) showed that the interaction between row spacing x weed treatments had a significant effect on dry weight/m^2 of grassy and broad leaved weeds and total dry weight of weeds, at 45 and 60 day after spraying DAS in both seasons, except total dry weight of weeds at 45 DAS, in the 1st one.

It was observed that the lowest values of dry weight of weeds/m^2 were obtained by herbicide Dinamic 70% WP by rate 0.75 kg/fed pre-emergence, with rows of sugarcane spaced at 80-cmin both seasons.

Table 11. Significant interaction effect between row spacing and weed control treatments on dry weight of weeds (g/m^2) in 2023/2024 and 2024/2025 seasons

	Treatments	Dry weight of weeds (g/m^2)										
		Grassy weeds at 45 DAS		Broad weeds at 45 DAS		Total weeds at 45 DAS	Grassy weeds at 60 DAS		Broad weeds at 60 DAS		Total weeds at 60 DAS	
		1st season	1st season	1st season	1st season	1st season	1st season	1st season	1st season	1st season	1st season	1st season
		Interactions (A × B)										
80 cm	Stomp (pre-emergence) 48%	22.67	15.33	40.00	26.67	42.00	19.00	36.00	35.00	44.00	54.00	80.00
	Dinamic (pre-emergence)70%	12.67	10.00	28.67	20.00	30.00	12.67	23.00	25.33	36.00	38.00	59.00
	Steler star (post-emergence) 21%	28.00	15.67	34.00	30.67	46.33	17.67	38.33	34.67	38.33	52.33	76.67
	Lomax (pre-emergence) 15%	20.00	17.33	37.33	24.67	42.00	20.00	29.67	33.00	39.67	53.00	69.33
	Lomax(post-emergence) 15%	22.33	16.00	29.00	25.67	41.67	19.33	38.00	37.33	36.67	56.67	71.33
	Dinamic (post-emergence) 48%	26.33	17.67	43.33	33.00	50.67	20.33	37.33	46.33	53.67	66.67	91.00
	Hand hoeing twice	32.33	17.00	47.00	31.00	48.00	18.33	33.67	41.00	48.33	59.33	82.00
	Unweeded treatment	304.67	281.67	512.67	482.00	763.00	304.00	364.33	512.00	552.67	816.00	917.00
100 cm	Stomp (pre-emergence) 48%	24.33	16.67	41.00	32.67	49.33	19.00	38.33	37.33	46.33	56.33	84.67
	Dinamic (pre-emergence)70%	16.67	10.67	30.67	25.67	36.33	13.00	23.67	25.67	37.67	38.67	61.33
	Steler star (post-emergence) 21%	29.67	17.00	35.00	27.33	44.33	20.67	39.67	36.67	42.33	57.33	82.00
	Lomax (pre-emergence) 15%	20.33	18.33	38.00	30.00	48.33	19.33	30.67	34.67	41.67	54.00	72.33
	Lomax(post-emergence) 15%	30.33	16.67	30.00	32.00	48.67	21.33	35.00	38.33	38.67	59.67	73.67
	Dinamic (post-emergence) 48%	32.00	19.33	43.67	37.00	56.33	22.33	39.00	47.00	64.67	69.33	103.67
	Hand hoeing twice	32.33	18.00	47.00	34.67	52.67	18.67	30.00	43.33	49.00	62.00	79.00
	Unweeded treatment	283.00	298.00	480.33	437.67	735.67	321.00	339.33	609.67	605.33	930.67	944.67
120 cm	Stomp (pre-emergence) 48%	26.00	17.67	41.33	33.67	51.33	16.00	38.00	36.33	47.67	52.33	85.67
	Dinamic (pre-emergence)70%	19.33	14.00	29.00	31.00	45.00	14.33	18.00	26.67	40.67	41.00	58.67
	Steler star (post-emergence) 21%	35.00	18.33	36.33	37.00	55.33	21.00	39.67	36.00	42.67	57.00	82.33
	Lomax (pre-emergence) 15%	22.33	17.67	38.67	33.67	51.33	21.67	32.33	34.67	43.33	56.33	75.67
	Lomax(post-emergence) 15%	30.67	16.67	30.33	30.33	47.00	22.33	35.33	38.00	39.00	60.33	74.33
	Dinamic (post-emergence) 48%	32.67	19.33	44.00	37.00	56.33	24.00	38.33	50.67	64.67	74.67	103.00
	Hand hoeing twice	33.33	19.33	48.33	44.67	64.00	22.00	33.33	45.00	50.33	67.00	83.67
	Unweeded treatment	285.00	307.00	459.33	460.67	767.67	340.67	364.67	600.00	606.33	940.67	971.00
LSD at 0.05		**27.37**	**13.53**	**22.62**	**29.59**	**31.34**	**8.91**	**29.01**	**27.07**	**20.45**	**31.79**	**28.14**

Growth parameters

The results obtained in Table (12) indicate that the interaction between row spacing and application weed control treatment significant on growth characters (length, diameter and weigh of stalk) in both seasons and number of millable canes in the 1st seasons.

The highest value of stalk diameter and Net-stalk fresh weigh were obtained by herbicide Dinamic 70% WP by rate 0.75 kg/fed pre-emergence, with rows of sugarcane spaced at 120-cm, while, the cane stalk longest was obtained when sprayed herbicide Dinamic 70% WP by rate 0.75 kg/fed pre-emergence with rows of sugarcane spaced at 100-cm, on the other hand, the highest number of millable canes/fed were achieved when sugarcane planted was at spaced rows of 80-cm, with getting rid of weeds by hand hoeing twice.

Table 12. Significant interaction effect between row spacing and weed control treatments on growth attributes in 2023/2024 and 2024/2025 seasons

Treatments		Stalk length (cm)		Stalk diameter (cm)		number of millable canes 1000/fed	Net-stalk fresh weight (kg)	
		1st season	2nd season	1st season	2nd season	1st season	1st season	2nd season
Interactions (A × B)								
٧٠ cm	Stomp (pre-emergence) 48%	299.33	291.67	2.53	2.47	46.190	1.222	1.232
	Dinamic (pre-emergence)70%	303.67	303.67	2.56	2.56	46.840	1.242	1.274
	Steler star (post-emergence) 21%	298.00	290.67	2.52	2.53	46.227	1.221	1.230
	Lomax (pre-emergence) 15%	301.33	296.33	2.55	2.54	46.402	1.225	1.259
	Lomax(post-emergence) 15%	298.76	292.33	2.53	2.54	46.813	1.222	1.247
	Dinamic (post-emergence) 48%	291.00	282.33	2.51	2.49	45.777	1.222	1.227
	Hand hoeing twice	303.67	300.33	2.57	2.53	46.937	1.236	1.227
	Unweeded treatment	175.00	189.00	1.43	1.50	26.233	0.786	0.753
100 cm	Stomp (pre-emergence) 48%	303.33	295.33	2.55	2.54	44.650	1.306	1.309
	Dinamic (pre-emergence)70%	310.00	316.00	2.59	2.56	45.720	1.342	1.343
	Steler star (post-emergence) 21%	300.33	292.00	2.54	2.54	44.777	1.312	1.302
	Lomax (pre-emergence) 15%	306.67	295.33	2.57	2.55	44.750	1.323	1.334
	Lomax(post-emergence) 15%	305.00	294.67	2.57	2.54	44.407	1.325	1.307
	Dinamic (post-emergence) 48%	299.00	283.00	2.53	2.53	43.737	1.311	1.303
	Hand hoeing twice	308.67	312.00	2.59	2.56	45.650	1.345	1.339
	Unweeded treatment	184.00	179.00	1.75	1.63	25.220	0.860	0.894
120 cm	Stomp (pre-emergence) 48%	287.67	287.00	2.57	2.57	41.000	1.360	1.374
	Dinamic (pre-emergence)70%	290.33	302.67	2.63	2.59	41.957	1.386	1.380
	Steler star (post-emergence) 21%	285.00	277.33	2.59	2.57	41.167	1.364	1.309
	Lomax (pre-emergence) 15%	287.33	292.00	2.59	2.55	41.200	1.364	1.367
	Lomax(post-emergence) 15%	287.00	287.00	2.60	2.57	41.017	1.366	1.377
	Dinamic (post-emergence) 48%	285.00	276.33	2.58	2.53	39.167	1.367	1.368
	Hand hoeing twice	292.33	294.67	2.62	2.59	41.767	1.366	1.374
	Unweeded treatment	160.67	162.67	1.87	1.73	23.767	0.847	827
LSD at 0.05		**5.52**	**4.82**	**0.07**	**0.06**	**0.881**	**0.015**	**0.021**

Quality traits

Data in Table (13) illustrate that the interaction between row spacing and weed control treatments showed significant differences sucrose and sugar recovery% only in the 1st season and purity% in the 1st and 2nd seasons, while brix% was not affected by the interaction, in both seasons.

Table 13. Significant interaction effect between row spacing and weed control treatments on quality juice characters 2023/2024 and 2024/2025 seasons

	Treatments	Sucrose %	Purity %		Sugar recovery %
		1st season	1st season	2nd season	1st season
		Interactions (A × B)			
٧٠ cm	Stomp (pre-emergence) 48%	15.90	83.33	83.21	10.60
	Dinamic (pre-emergence)70%	16.03	83.22	83.34	10.67
	Steler star (post-emergence) 21%	15.79	83.14	83.37	10.50
	Lomax (pre-emergence) 15%	15.87	83.24	83.29	10.57
	Lomax(post-emergence) 15%	15.67	83.13	83.08	10.42
	Dinamic (post-emergence) 48%	15.68	83.19	83.44	10.37
	Hand hoeing twice	15.77	83.36	83.23	10.52
	Unweeded treatment	1417	82.54	81.86	9.36
100 cm	Stomp (pre-emergence) 48%	16.25	83.72	83.68	10.88
	Dinamic (pre-emergence)70%	16.38	83.65	83.54	10.69
	Steler star (post-emergence) 21%	16.21	83.67	83.55	10.85
	Lomax (pre-emergence) 15%	16.19	83.63	83.75	10.84
	Lomax(post-emergence) 15%	16.08	83.49	83.70	10.74
	Dinamic (post-emergence) 48%	15.77	83.34	83.65	10.52
	Hand hoeing twice	16.35	83.69	83.77	10.95
	Unweeded treatment	14.76	83.25	81.69	9.84
120 cm	Stomp (pre-emergence) 48%	16.01	83.54	83.64	10.70
	Dinamic (pre-emergence)70%	16.16	83.75	83.75	10.82
	Steler star (post-emergence) 21%	15.91	83.38	83.22	10.61
	Lomax (pre-emergence) 15%	15.88	83.46	83.80	10.60
	Lomax(post-emergence) 15%	15.67	83.39	83.36	10.51
	Dinamic (post-emergence) 48%	15.38	83.36	83.58	10.25
	Hand hoeing twice	15.97	83.51	83.62	10.67
	Unweeded treatment	14.82	82.03	81.78	9.73
	LSD at 0.05	**0.46**	**0.37**	**0.29**	**0.33**

Cane and sugar yields (ton/fed)

Cane and sugar yields/fed in Table (14) was significantly influenced by the interaction between the studied factors in both seasons.

The highest cane and sugar yields/fed of the 1st and 2nd was obtained when planting sugarcane in rows spaced at 100-cm apart in combination with the use of herbicide Dinamic70% WP by rate 0.75 kg/fed pre-emergence and/or hand hoeing twice to eliminate weeds in both seasons without a significant variance between them in both seasons.

Table 14. Significant interaction effect between row spacing and weed control treatments on yields in 2023/2024 and 2024/2025 seasons

Treatments		Cane yield (tone/fed)		Sugar yield (tone/fed)	
		1st season	2nd season	1st season	2nd season
Interactions (A × B)					
80 cm	Stomp (pre-emergence) 48%	56.448	57.897	5.983	5.938
	Dinamic (pre-emergence)70%	58.181	62.057	6.209	6.506
	Steler star (post-emergence) 21%	56.440	57.410	5.928	5.912
	Lomax (pre-emergence) 15%	56.828	60.100	6.007	6.261
	Lomax(post-emergence) 15%	57.222	58.770	5.964	6.011
	Dinamic (post-emergence) 48%	55.943	55.149	5.800	5.562
	Hand hoeing twice	58.025	62.093	6.102	6.447
	Unweeded treatment	20.607	19.657	1.928	1.705
100 cm	Stomp (pre-emergence) 48%	58.300	60.063	6.345	6.545
	Dinamic (pre-emergence)70%	61.343	62.973	6.723	7.028
	Steler star (post-emergence) 21%	58.757	58.353	6.374	6.269
	Lomax (pre-emergence) 15%	59.223	60.985	6.417	6.723
	Lomax(post-emergence) 15%	58.822	58.773	6.320	6.456
	Dinamic (post-emergence) 48%	57.335	56.892	6.028	6.135
	Hand hoeing twice	61.413	62.637	6.724	6.995
	Unweeded treatment	21.675	22.313	2.130	1.982
120 cm	Stomp (pre-emergence) 48%	55.768	57.553	5.967	6.208
	Dinamic (pre-emergence)70%	57.353	58.870	6.209	6.525
	Steler star (post-emergence) 21%	56.137	56.350	5.957	5.922
	Lomax (pre-emergence) 15%	56.187	58.013	5.955	6.345
	Lomax(post-emergence) 15%	56.020	57.360	5.889	6.143
	Dinamic (post-emergence) 48%	54.280	55.227	5.561	5.860
	Hand hoeing twice	57.043	58.690	6.086	6.392
	Unweeded treatment	20.130	17.863	1.957	1.570
LSD at 0.05		**0.986**	**1.271**	**0.156**	**0.157**

Economic evaluation

Total costs

Data in Table (15) clear that increasing row spacing from 80 to 100 and 120 cm gradually decreased the total costs (L.E.) Applying 80 cm gave the maximum values of total costs i.e. 71915 and 86915 L.E. in the first and second seasons respectively. While the minimum values i.e. 68415 and 83415 L.E. in both seasons, respectively were obtained with applying row spacing at 120 cm.

The results showed that the weed control treatments showed different values in the total costs (L.E.), and the use of weeding twice by hand hoeing achieved the highest total costs i.e. 74957 and 89957 L.E. in both seasons, respectively, while the control treatment gave the lowest total costs of 67757 and82757 L.E. in the first and second season, respectively values in the total income.

The maximum total costs i.e. 76690 and 91690 L.E. was obtained from row spacing at 80 cm with hand hoeing twice in the 1st and 2nd seasons, respectively.

Gross income

Data in Table (15) manifest that planting sugarcane at 100 cm row space resulted in 3864.15 and 5388.75 L.E higher in gross income than that planting at 80 cm or 120 cm, respectively, in the 1st season, corresponding to 3203.20 and 7495.50 L.E., in the 2nd one .Likewise, it was found that the application of Dinamic herbicide gave the highest income, followed by the use of twice hoeing in both seasons compared with the check treatment in both seasons.

The positive influences of application of Dinamic herbicide and three-time hoeing on gross income are probably referred to higher cane yield/fed.

The maximum gross income i.e. 110543.4 L.E. was obtained from planting sugarcane at 100 cm with using hand hoeing twice in the 1st seasons.

While, planting sugarcane at 100 cm with using Dinamic (pre-emergence) gave the maximum gross income where he gave 163729.80 in the second season.

Table 15. Total costs and Gross income (by Egyptian pound) as affected by row spacing, weed control treatments and their interactions in 2023/2024 and 2024/2025 seasons

Weed control (B)	Total cost L.E.							
	2023/2024				2024/2025			
	Row spacing (A)			Mean	Row spacing (A)			Mean
	80 cm	100 cm	120 cm		80 cm	100 cm	120 cm	
Stomp (pre-emergence) 48%	71090	69390	67590	69357	86090	84390	82590	84357
Dinamic (pre-emergence)70%	71940	70240	68440	70207	86940	85240	83440	85207
Steler star (post-emergence) 21%	70990	69290	67490	69257	85990	84290	82490	84257
Lomax (pre-emergence) 15%	71590	69890	68090	69857	86590	84890	83090	84857
Lomax(post-emergence) 15%	71590	69890	68090	69857	86590	84890	83090	84857
Dinamic (post-emergence) 48%	71940	70240	68440	70207	86940	85240	83440	85207
Hand hoeing twice	76690	74990	73190	74957	91690	89990	88190	89957
Unweeded treatment	69490	67790	65990	67757	84490	82790	80990	82757
Mean	71915	70215	68415		86915	85215	83415	
	Gross income L.E							
Stomp (pre-emergence) 48%	101606.4	104940.0	100382.4	102310.20	150532.2	156163.8	149637.8	152110.4
Dinamic (pre-emergence)70%	104725.8	110417.4	103235.4	106126.20	161348.2	163729.8	153062.0	159380.0
Steler star (post-emergence) 21%	101592.0	105762.6	101046.6	102799.80	149266.0	151717.8	146510.0	149164.6
Lomax (pre-emergence) 15%	102290.4	106601.4	101136.6	103343.40	156260.0	158561.0	150833.8	155217.4
Lomax(post-emergence) 15%	102999.6	105879.6	100836.0	103237.20	152802.0	152809.8	149136.0	151582.6
Dinamic (post-emergence) 48%	100697.4	103203.0	97704.00	100535.40	143387.4	147919.2	143590.2	144965.6
Hand hoeing twice	104445.0	110543.4	102677.4	105888.60	161441.8	162856.2	152594.0	158964.0
Unweeded treatment	37092.60	39015.00	36234.00	37447.20	51108.20	58013.80	46443.80	51854.40
Mean	94431.15	98295.30	92906.55		140768.2	143971.4	136475.9	

Net income

Data in Table (16) clear that planning sugarcane at 100 cm in case of spacing resulted in 5564.10 and 3588.70 L.E. higher in net income than that given by sugarcane planning with 80 or 120 cm in case of spacing, respectively in the 1st season, corresponding to were 4903.2 and 5695.40 L.E., in the 2nd one.

As for the net income resulted from application of the eight weed control treatments, the results indicated that the controlling weeds by Dinamic (pre-emergence) herbicides (LE. 35919.5 and 74173.3), which was approximately bigger than to manual hoeing twice (LE. 30931.9 and 69007.3 in both seasons), while Steler star (post-emergence), Lomax (pre-emergence) and hand hoeing twice ranked the third. The lowest net income were recorded when weeds left to grow without any control. The maximum net income i.e. 40177.40 and 78489.8 L.E. was produced from applying planting sugarcane at 100 cm with using Dinamic (pre-emergence) herbicides in the 1st and 2nd seasons, respectively.

Benefit/cost ratio

Data in Table (16) show the values of benefit/cost ratio which express the relative cash advantage of the gained money of the harvested sugarcane versus that paid as costs for its production. The results pointed out that the planting sugarcane at 100 cm had the highest benefit/cost ratio, of 39.99 and 68.95 in the 1st and 2nd seasons. However, the lowest benefit/cost were recorded when weeds left to grow without any control. As for the benefit/cost ratio resulted from application of the eight weed control treatments, the results indicated that the controlling weeds by Dinamic (pre-emergence) herbicides (LE. 51.16 and 87.05), which was approximately bigger than to manual hoeing twice (LE. 41.27 and 76.71 in both

seasons), while Steler star (post-emergence), Lomax (pre-emergence) and hand hoeing twice ranked the third. The lowest benefit/cost were recorded when weeds left to grow without any control. The maximum benefit/cost ratio i.e. 57.20 and 92.08 L.E. was obtained from applying planting sugarcane at 100 cm with using Dinamic (pre-emergence) herbicides in the 1st and 2nd seasons, respectively.

Table 16. Net income (by Egyptian pound) and profitability as affected by row spacing, weed control treatments and their interactions in 2023/2024 and 2024/2025 seasons

Weed control (B)	Net income L.E							
	2023/2024				2024/2025			
	Row spacing (A)			Mean	Row spacing (A)			Mean
	80 cm	100cm	120 cm		80 cm	100 cm	120 cm	
Stomp (pre-emergence) 48%	30516.4	35550.0	32792.4	32953.5	64442.2	71773.8	67047.8	67753.7
Dinamic (pre-emergence)70%	32785.8	40177.4	34795.4	35919.5	74408.2	78489.8	69622.0	74173.3
Steler star (post-emergence) 21%	30602.0	36472.6	33556.6	33543.1	63276.0	67427.8	64020.0	64907.9
Lomax (pre-emergence) 15%	30700.4	36711.4	33046.6	33486.7	69670.0	73671.0	67743.8	70360.7
Lomax(post-emergence) 15%	31409.6	35989.6	32746.0	33380.5	66212.0	67919.8	66046.0	66725.9
Dinamic (post-emergence) 48%	28757.4	32963.0	29264.0	30328.7	56447.4	62679.2	60150.2	59758.9
Hand hoeing twice	27755.0	35553.4	29487.4	30931.9	69751.8	72866.2	64404.0	69007.3
Unweeded treatment	-32397.4	-28775.0	-29756.0	-30309.5	-33381.8	-24776.2	-34546.2	-30902.3
Mean	22516.2	28080.3	24491.6		53853.2	58756.4	53061.0	
	Profitability (%)							
Stomp (pre-emergence) 48%	42.93	51.23	48.52	47.51	74.85	85.05	81.18	80.32
Dinamic (pre-emergence)70%	45.57	57.20	50.84	51.16	85.59	92.08	83.44	87.05
Steler star (post-emergence) 21%	43.11	52.64	49.72	48.43	73.59	80.00	77.61	77.04
Lomax (pre-emergence) 15%	42.88	52.53	48.53	47.94	80.46	86.78	81.53	82.92
Lomax(post-emergence) 15%	43.87	51.49	48.09	47.78	76.47	80.01	79.49	78.63
Dinamic (post-emergence) 48%	39.97	46.93	42.76	43.20	64.93	73.53	72.09	70.13
Hand hoeing twice	36.19	47.41	40.29	41.27	76.07	80.97	73.03	76.71
Unweeded treatment	-46.62	-42.45	-45.09	-44.73	-39.51	-29.93	-42.65	-37.34
Mean	31.31	39.99	35.80		61.96	68.95	63.61	

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Conclusion

Under conditions of the present work, growing sugarcane, in rows spaced at 100-cm apart and controlling accompanied weeds with sugarcane plants by use of herbicide Dinamic 70% WP by rate 750 g/fed pre-emergence and/or hand hoeing twice, 30 and 60 DAP can be recommended for getting the highest cane and sugar yields/fed. Meanwhile, economic evaluation of the studied factors showed that planting sugarcane in rows of 100-cm apart, as well as controlling weeds by applying Dinamic 70% WP by rate 750 g/fed pre-emergence gave the highest values of net income and profitability%.

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