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Effect of planting spaces and Arrow herbicide on growth and yield of *Zea mays* L. and weeds accompanying it

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Abstract

The experiment was carried out at summer agriculture season 2021 (Nineveh governorate) at two location (Al-Rashedia and Al-Numrood). The experiment include two factors, planting spaces (60, 75 cm) and control treatments (control, hand weeding, Arrow herbicide concentration 30 , 60 , 90 ml / h-1) . The experiment applied according factorial experiments (split plot) using R . C . B . D) with three replications. The seeds have been planted (Drakma variety) at 30 May and 1 April for two locations respectively . the field has been fertilized by 120 kg / h-1 . The herbicide has been spraying after one month of planting. The results are summarized as follows: the planting spaces did not differ in their effect on the number of narrow and broad leaves weeds, while the second space is superior than the first space of the number and dry weight the narrow leaves weeds .by (0.46 and 2.95 gm) , the second space superior than the first with total yield by (3.02 gm) at Al-Rashedia location while the first space superior than the second space by (40 gm) at Al-Numrood location. The three concentrations and hand weeding outperformed compared to control treatment at low the number and dry weight of narrow and broad leaves weeds.

Keywords: Arrow herbicide, planting spaces, *Zea mays* L.

INTRODUCTION

Corn is an important grains crop in Iraq and the world ,it ranks second after wheat in terms of cultivated area (Stuessy, 2009) , and its cultivation is spread in semi-dry areas of tropical and subtropical regions (Dambiwal), 2017), the importance of the crop is due to its various uses, it use human food directly and its use in animal relation, and the quality of seeds used in

agriculture may have an important impact on crop growth and production, as high-quality seeds have several specifications. Well filled (large in size) and homogeneity in the sample prepared for agriculture, which reflects the homogeneity of plant growth within the plant community, maize belongs to the Poaceae family, which includes a number of races, the most important of which is the Zea genus, which includes a planted species, corn *Zea mays* L., high lighting the importance of yellow maize from its versatility as food and fodder for animals and all its vegetative and fruit parts. The spread of weeds in maize fields is a major production problem , the weeds competes with crop plants for growth requirements such as light, nutrients, water and CO2, and it acts as a host for insects and diseases (Curran 2004) the weeds not only reduces the amount of the crop but reduces its quality and causes problems with irrigation and harvesting. The maize crop is a sensitive crop to compete with the weeds , especially in the early stages of the life of the plant (derksen et al , 2002) leading to a clear shortage of yield , it has been shown that the weeds leads to a reduction of the yield of maize grains by up to 19-52% These results are in agreement with Al-Obaidi's (2019).

MATERIALS AND RESEARCH METHODS

The experiment was carried out in the summer agricultural season 2021 at the Rashidiya and Al-Namrod sites (Nineveh province), the first involving two factors: planting spaces (60cm-75cm) and the second factor five control control treatments and included (control, hand weeding, Arrow herbicide with three concentrations 30 g/h, 60g/h, 90 g/h). The experiment was applied according to factorial experiments (split plot) using Randomized Complete Block Design with three replication , the seeds were planted cultivar (Drachma) on 30 May and 1 Aprir for the two sites respectively, the experiment was irrigated immediately after agriculture and repeated irrigation whenever needed, the field was fertilized according to the recommendations of the Iraqi Ministry of Agriculture 125 kg / h-1, the herbicide has been sprayed after month of planting , at the end of the season took the following data:

Number and dry weight of narrow and broad leaves, plant height, leave area, the number of cods, the number of rows of cob, the number of grain / cob, the weight of 500 grain , the percentage of protein, the grain yield . The statistical analysis of all results was carried out on the basis of variance analysis of the characteristics studied by computer design (SAS-V9, 2002) according to the SAS statistical analysis system according to the working trial system (Split plots) and by the design of Randomized Complete Block Design sectors and the calculation averages of transactions were compared using the Duncan multi-range test with a probability level of 0.05 (Al-Rawee and Khalf alla , 2000).

RESULTS AND DISCUSSION

1. The effect of planting spaces in the studying traits: table 1 indicates that there are significant differences between the planting spaces in its effect on the number of narrow and broad leaves weeds at Al-Rashedia (0.46 , 2.95 gm , while no significant differences at Al-Namrood ,these results are consistent with the findings of Baron et al. (2006) on the positive effect of narrow space and their role in reducing the number of weeds

The table also indicates that there are no significant differences between the two spaces in their effect on the plant height and both sites are consistent with the findings of Shuweila (2000), which showed the lack of significant effect of agricultural spaces on plant height, while the second space exceeded than the first space in the leaves area of the Al-Namrood site by (16.46 cm) these results are consistent with the findings of Ameri (2001) , while both spaces did not differ in their effect on this traits in Nimrod site and this is in accordance with what reached Al-hadede (2007) . As for the number of cobs the two distances did not differ in their effect on this traits at two sites.

The characteristic of the weight of the cobs was affected by different agricultural space as the second distance exceeded the first space in the site of Al-Nimrud and this indicates that the Rashidia location has a higher fertility than the site of Nimrud , the number of rows / cob was not affected by the differ of planting spaces for both sites, the number of cobs grains was not affected by the different planting spaces of Rashidiya site , while the first space exceeded the second at the Nimrud site by (9.35 grain) this is consistent with what Al Hadidi (2007) and Salem Others (2005) found on the significant effect of planting spaces on the increase of the number of rows / cob where they found that the wide space between the lines gave an increase in the rate of rows for cobs and may be due to the increased index of leave space the more sun block and increased competition on manufactured materials that are basically few due to lack of photosynthesis due to sun block, The characteristics of 500 grains were not affected by the planting spaces and both sites are consistent with the findings of Ameri (2001), Salem et al (2005) and the percentage of protein was not affected by different planting spaces and at both sites . The first space exceeded the second in its effect on the yield at Al-Namrood site by (40 grain) while the second space superior than the first by (3.02 grain) at Al-Rashedia site , this result is consistent with the findings of Shuweila (2000), Aluk (2001), Bektaş and Wahib (2004), Al-Rawee et al (2005).

2. The effect of Arrow herbicide in the quastudied traits : The results of table 3 indicate that the treatment of hand weeding exceeds the other of the control treatments in recording the lowest significant value of the

number of the narrow leaves weed which reached (1.66 and 2.99) that outperformed the control treatment by (5.99 and 6.83) at both locations, respectively, but in the dry weight of the narrow leaves weed , the high concentration of the Arrow herbicide was superior to concentration (60g/h) in the lowest value record for the number and dry weight of narrow leaves weeds (0.17 and 3.79 gm) at Al-Rashedia.

The results from the same table indicate that the treatment of the Arrow herbicide of concentration (60 g/h) that recording the highest significant value of the traits (plant height, leave area, number of cobs) compared with the control treatment in which the lowest value of this characteristic . As for the weight of the cobs, the treatment of hand weeding recorded the highest value of this characteristic, which morally outperformed the control treatment by (61.98 and 27.05 gm) for the two site .

Number of grains / cob, the treatment of the Arrow herbicide exceeded the second concentration (60 g/h) in giving the highest value to this characteristic compared to the control treatment by (209.99 and 81.99) at both sites, respectively. As for the weight of 500 grain, did not significant differences among the concentrations of herbicide at Al-Namrood site . As a grains yield, the treatment of the Arrow herbicide 60 ml/ h-1 which recorded the highest value of this characteristic, which exceeded the control treatment by (1452.24 gm and 343.18 gm) for the two site .

3. The effect of interaction between planting spaces and Arrow herbicide concentrations : Table 3 indicates significant difference between treatments , the treatment of hand weeding and Arrow herbicide exceeded the first concentration (30 g/h) at space (60) Cm as well as the treatment of hand weeding at space with (75) cm in the recording of the lowest significant value of the number of narrow leaves weed while the highest value of this characteristic was recorded when the control treatment (5.66 and 6.33) at both space at the site Al-Rashidia, respectively. At the Nimrod site, the lowest number of narrow leaves weed was recorded when the hand weeding and Arrow herbicide were treated with the second concentration (60 g/h) at a space of (60) cm , which outperformed the control treatment for the same space by (4 and 4.2), At the space (75 cm) of the Nimrod site , the treatment of the herbicide exceeded all the concentrations used (25,50 and 75 g/h in recording the lowest number of narrow leaves weed , which in turn exceeded the control treatment which recorded the highest value was (7.33) weed .

At the dry weight of the narrow leaves weed , the treatment of hand weeding and the treatment of the Arrow herbicide exceeded the second concentration (60) g/h at the space (60) cm in the registration of this characteristic while the highest dry weight of the narrow leaves weed was recorded when dealing with the control , which 35.67 g, but for the space (75) cm for the same location (Al-Rashidia) the treatment of the exterminator

Arrow exceeded the third concentration (75 g/h in recording the lowest dry weight of the narrow leaves weed which exceeded the treatment of control by (18.33 g). At the Al-Nimrod site, the lowest value of this characteristic was recorded when the hand weeding was treated for the space (60) cm and reached (14.33 g), while the highest dry weight value of narrow leaves weed was recorded when the comparison of the space (75 cm) was 57.00 g.

The number of broad leaves weed, the lowest number of broad leaves weed was recorded in the treatment of hand weeding and Arrow herbicide concentration (90 g/h) and both planting spaces (60cm and 75cm) , while the highest number of broad leaves weed was recorded at the time of control treatment and reached (5.83 and 6.00) for Al-Rashidiya location for both space , respectively. At the Al-Nimrod site, the treatment of the Arrow herbicide in the first space (60 cm) recorded the lowest number of broad leaves weed, which superior than the other treatments and the control treatment by (8.34). As for the dry weight of the broad leaves weed , the lowest value of this characteristic was recorded when the Arrow herbicide was treated with concentration (60 g/h at the second space (75) cm, which outperformed the other treatments and control treatment for the site of Rashidia, but in the site of Nimrod also outperformed the treatment of the Arrow herbicide by second concentration at the space (75) cm in recording the lowest dry weight of the broad leaves weed while the highest dry weight of this characteristic was recorded when the control and planting space (75) cm. plant height, the treatment of the Arrow herbicide exceeded the second concentration of the space (75) cm which giving the highest value to this characteristic and reached (195.55 cm) which outperformed the other of the treatments and the control treatment by (13.11%) for the site of Al-Rashidia. At the Al- Nimrod site, the treatment of the Arrow herbicide exceeded the second concentration and the planting space (60 cm) that giving the highest value to this characteristic and reached (190.33 cm) which outperformed the other of the treatments and the control treatment by 8.93 percent. In the form of leaves area and the number of cobs , the treatment of the Arrow herbicide exceeded the second concentration of the space of planting (60) cm for both sites that giving the highest significant value to this characteristic, which exceeded the control treatment by (191.63 and 5.66) for the Al-Rashidiya site and (169.42 and 4.77) for the Site of Al-Nimrod, respectively. As for the weight of the cob, the treatment of hand weeding at the first space and the treatment of the Arrow herbicide by concentration (75 g/h at the second space) exceeded the highest value of this characteristic compared to the control treatment at the first space, which recorded the lowest value of this characteristic and reached (82.96 g) for the site of Al-Rashidia. At the Al-Nimrod site, the treatment of the Arrow herbicide with the second concentration at the first space recorded the highest value of this

characteristic compared to the rest of the treatments and control treatment at the second space , which exceeded it by (53.87 g).

Table 3 indicate to the treatment of Arrow herbicide exceeds the second concentration (60 g/h) that giving the highest value to the row of the number of rows of cobs (14.00) and the number of grain /cob (522.67) for the first planting space , while the lowest value of these two qualities was recorded when comparing and for the same space of agriculture for the Al-Rashidia site. At the Nimrod site, the highest value was recorded for the number of rows of cobs at the hand weeding treatment and both spaces (60cm and 75cm), while the lowest value was recorded for this characteristic when comparing and for the two planting spaces , which did not significant differ from the treatment of the Arrow herbicide with the first concentration of the first space and Arrow herbicide with the first and second concentration at the second space .As for the weight of 500 grain , the treatment of the Arrow herbicide exceeded the second concentration of the second space that giving the highest significant value to this characteristic and both sites, which outperformed the other treatments and the control treatment of the first space by (8.68) for the site Al- Rashidia and (25.14) for the control treatment of the second control of the site Al-Nimrod.

From the same table, the control treatment of both space (60cm and 75cm) exceeded the significant value of the protein percentage and reached (10.01 and 10.00), respectively, which outperformed the other of the treatments. While these treatments did not significant differ among them at giving the lowest value to this characteristic, but in the site of Al-Nimrod the results did not differ from the situation in the site of Rashidiya where the control treatment and both space (60 cm and 75 cm) exceeded which giving the highest significant value the percentage of protein was 10.51 and 10.43, while the lowest value of the protein percentage was recorded when the Arrow herbicide was treated with the third concentration of the first space and the treatment of the Arrow herbicide with the second concentration of the second space . As for the grains yield , the treatment of the Arrow herbicide with the second concentration of the first planting space recorded the highest significant value of this characteristic and outperformed the others of the treatments and the control treatment by (68.07%) at the Site of Al-Rashidiya, while in the site of Nimrod , the treatment of hand weeding for the first space (60 cm) recorded the highest value of the grains, which significant outperformed the other of the treatments and the control treatment by (30.90%).

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Table (1) The effect of agricultural distances on the qualities studied (Rashedia and Numrood).

	No of narrow weeds	Dry weight of narrow leaves weed	No of broad leaves weed	Dry weight of broad leaves weed	Plant hight	Leaves area	Number of ears	Weight of ear gm	No .of ears line	No of ear grain	Weight of 500 grain	% protein	Grain yield
Al-Rashedia													
60cm	2.53b	18.73b	3.22a	33.14a	188.03a	486.57a	13.96a	131.53b	13.06a	444.94a	123.79a	9.44a	1476.40b
75cm	2.99a	21.68a	3.16a	29.10b	191.99a	483.41a	14.19a	153.59a	12.80a	495.00a	125.32a	9.47a	1479.42a
Al-Numrood													
60cm	3.26b	23.71b	5.33a	42.08b	182.50a	541.26b	11.31a	82.51a	10.98a	319.82a	116.20a	9.55a	1101.28a
75cm	4.11a	31.88a	5.06a	47.64a	182.57a	557.72a	12.18a	78.53b	10.83a	310.47b	116.50a	9.60a	1061.93b

Table (2) The effect of agricultural distances on the qualities studied (Rashedia and Numrood)

		No of narrow weeds	Dry weight of narrow leaves weed	No of broad leaves weed	Dry weight of broad leaves weed	Plant hight	Leaves area	Number of ears	Weight of ear gm	NO of ears line	No of ear grain	Weight of 500 grain	% protein	Grain yield
Al-Rashedia														
control		5.99a	36.50a	5.91a	51.00a	177.05b	371.76c	11.23b	95.98e	10.86c	391.01d	120.73c	10.00a	666.33e
Hand weed		1.66c	16.16c	1.36d	16.83e	191.88ab	505.56b	16.40a	157.96b	14.49a	378.18d	122.99c	9.27b	1669.33c
Arrow	30g	2.67b	21.49b	4.53b	41.02b	191.99ab	499.46b	12.50b	134.04d	12.46b	452.00c	122.99c	9.18b	1193.80d
	60 g	1.83c	15.33c	1.72d	19.83d	200.27a	543.29a	16.59a	182.23a	14.20a	601.00a	129.41a	8.94b	2118.57a
	90 g	1.66c	11.54d	2.45c	26.92c	188.86ab	504.90b	13.66ab	142.59c	12.65b	527.67b	126.66b	9.87a	1741.50b
Al-Numrood														
control		6.83a	46.50a	10.83a	103.16a	172.60d	471.12e	8.49c	51.11d	8.66c	271.34d	99.23c	10.47a	845.00d
Hand weed		2.99c	22.66cd	4.44b	29.49c	183.27bc	493.62d	12.33b	78.16c	12.95a	328.14c	115.83b	9.68c	1146.16b
Arrow	30g	3.50b	25.49b	4.27b	42.92b	186.94ab	537.85c	11.87b	78.73c	8.95c	276.95d	120.49a	9.066d	1118.33c
	60 g	2.39d	20.65d	2.84c	18.67d	190.77a	648.87b	13.74a	103.07a	12.91a	353.33a	123.53a	8.82e	1188.34a
	90 g	2.72cd	23.66bc	3.61bc	30.06c	179.10c	596.00b	12.31b	91.51b	11.05b	345.98b	122.66a	9.85b	1110.20c

Table (3) The effect of interference between the distances of agriculture and the composition of an exterminator in the qualities studied (Al-Rashedia).

Planting space	Arrow herbicide		No of narrow weeds	Dry weight of narrow leaves weed	No of broad leaves weed	Dry weight of broad leaves weed	Plant hight	Leaves area	Number of ears	Weight of ear gm	No. of ears line	No. of ear grain	Weight of 500 grain	% protein	Grain yield
60 cm	Control		5.66a	35.67a	5.83a	58.00a	170.55b	355.48g	11.00d	82.96g	11.06cd	295.37f	120.65e	10.01a	690.00i
	Handweeding		1.66cd	12.33de	1.39f	18.33e	190.11ab	495.82de	16.33abc	165.33bc	14.66a	333.37f	122.33cde	9.21ab	1607.67f
	Arrow	30	2.34bc	21.33b	4.89b	42.71b	190.77ab	513.93b	13.00abcd	111.93ef	12.59abcd	445.00e	121.33de	9.13ab	1206.67g
		60	1.66cd	14.00d	1.79ef	20.33e	200.11a	567.58a	17.14a	174.00b	14.00ab	616.73a	129.34a	8.97b	2177.99a
		90	1.33d	10.33e	2.24de	26.33d	188.61ab	500.07cd	12.33abcd	123.46e	13.00abc	534.27bc	125.33bc	9.88a	1699.67e
75 cm	Control		6.33a	37.33a	6.00a	44.00b	183.55ab	388.04f	11.46cd	109.00f	10.66d	486.66cde	120.81e	10.00a	642.67j
	Handweeding		1.66cd	20.00b	1.34f	15.33f	193.66ab	515.31b	16.48ab	150.60d	14.33ab	423.00e	123.66cde	9.34ab	1731.00d
	Arrow	30	3.00b	21.66b	4.18c	39.33c	193.22ab	484.99e	12.01bcd	156.16cd	12.33bcd	459.00de	124.66cde	9.23ab	1180.94h
		60	2.00cd	16.67c	1.65f	19.33e	200.44a	519.00b	16.04abc	190.46a	14.41ab	585.27ab	129.48a	8.92b	2059.16b
		90	2.00cd	12.75d	2.66d	27.51d	189.11ab	509.74bc	15.00abcd	161.73cd	12.31bcd	521.08bcd	128.00ab	9.86a	1783.33c

Table (3) The effect of interference between the distances of agriculture and the composition of an exterminator in the qualities studied (Al-Numrood).

Planting space	Arrow Herbicide		No of narrow weeds	Dry weight of narrow leaves weed	No of broad leaves weed	Dry weight of broad leaves weed	Plant hight	Leaves area	Number of ears	Weight of ear gm	No. of ears line	No. of ear grain	Weight of 500 grain	% protein	Grain yield
60 cm	Control		6.33b	36.00b	11.00a	99.66b	173.33cd	465.08g	8.33e	61.00f	9.00c	291.67d	100.00d	10.51a	834.00h
	Handweeding		2.33de	14.33g	4.89b	27.66f	183.22ab	481.16f	10.66d	85.00cd	13.00a	330.61c	113.33c	9.56c	1207.00a
	Arrow	30	3.00d	24.33de	4.21bc	38.52d	185.55ab	524.38d	12.33bc	74.46e	9.00c	272.89e	120.33ab	9.08d	1140.33c
		60	2.00e	19.89f	2.69c	17.24g	190.65a	645.01a	13.64a	102.09a	13.08a	360.33a	124.03a	8.78e	1208.01a
		90	2.66d	24.00de	3.88bc	27.33f	179.76bc	590.68b	11.62cd	90.00bc	10.83b	343.64b	123.33a	9.83b	1117.08d
75 cm	Control		7.33a	57.00a	10.66a	106.66a	171.88d	477.16fg	8.66e	41.23g	8.33c	251.02f	98.47d	10.43a	856.00g
	Handweeding		3.66c	31.00c	4.00bc	31.33ef	183.32ab	506.08e	14.00a	71.33e	12.90a	325.67c	118.34b	9.80b	1085.33f
	Arrow	30	4.00c	26.66d	4.34bc	47.33c	188.33a	551.33c	11.42cd	83.00d	8.91c	281.01e	120.65ab	9.05d	1096.33ef
		60	2.78d	21.41ef	3.00c	20.10g	190.88a	652.74a	13.84a	104.06a	12.74a	346.33b	123.04a	8.86e	1168.67b
		90	2.78d	23.33e	3.34bc	32.80e	178.44bcd	601.32b	13.00ab	93.03b	11.28b	348.33b	122.00ab	9.88b	1103.33e