Effect of adding nitrogen and iron on yield components and medicinal materials in corn (Zea mays L).

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Abstract

A field experiment was conducted in autumn and spring seasons for 2020 and 2021, respectively, in one of the private farms in the village of Al-Jilawia, affiliated to the Alexandria district (30 km north of Babylon). The factorial experiment was conducted according to a randomized complete block design (R.C.B.D). The experiment included two factors, namely nitrogen fertilization (added to soil): two batches, three batches, four batches. which sumbylized by (N1, N2, N3). As for the second factor, there are three levels of iron (0, 50, 100 mg.l-1) and which sumbylized by (Fe0, Fe1, Fe2), respectively, and with three replicates. The results gave the following: The level (N3) was significantly excelled on the rest of the levels of nitrogen fertilization and for all studied traits except for the percentage of glucose in the caloric of corn and for the autumn and spring seasons. While the treatment (N1) for the traits of the percentage of glucose in the calorie of yellow corn was significantly excelled on all treatments. As for adding iron as a spray on the leaves, the level (Fe2) excelled for all the studied traits, giving the highest averages for the studied traits for both the autumn and spring seasons. As for the interaction between nitrogen and iron, the combination (N3 X Fe2) excelled giving the highest average for all studied traits and for the autumn and spring seasons.

Keywords: **corn calories, glucose, bi-interaction, synthesis, RCBD**

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Introduction

corn is of high economic importance, where it occupies the third place after the wheat and rice crops, in terms of the cultivated area, productivity and economic importance, due to its multiple uses in the manufacture of paper, oil, starch, sugar and paper.), calcium, sodium and other substances (Kebede and Anbasa, 2017) In addition, its seeds and their freedom contain many medicinal substances, including flavonoids, phenols, antioxidant factors, unsaturated acids, sucrose and fructose, which made it a source of treatment for many diseases (Bukhtsh et al., 2011). Since nitrogen is transformed in the plant into amino acids and then into protein, it directly enters into the formation of cells and their membranes and the fullness of the grain and thus increase the weight and production. (Meharg and Marschner, 2012).Therefore, the increase in production of the corn crop has been associated with fertilization in general, and specifically nitrogen fertilization, and its deficiency leads to dwarfing of the plant and the decrease in the number of leaves and the inhibition or disruption of most vital functions such as photosynthesis, respiration, the transfer of manufactured materials and acceleration of leaf senescence (Al-Ani, 2018). As for iron, it has a great role in most of the vital processes, including respiration and photosynthesis (Parker, 2012), in addition to its entry into the synthesis of more than 35 enzymes, so it is of major active importance in the activity and vitality of the plant, and then its vegetative, fruitful and qualitative production (Roohta, 2015) and it was proven (Al-Tamimi, 2017) that spraying iron increases the height of the plant as it accelerates cell division and elongation, so the number of leaves increases, so the leaf area increases, so the yield increases and corn contains a lot of medicinal substances such as sucrose, fructose, unsaturated acids and phenolic compounds. Fertilizing increases the concentration of these medically active substances (Choi et al., 2014) and due to the low production in Iraq compared to the global production, so the nitrogen was fragmented and interaction with iron to increase the yield in quantity, quality and medicinal materials. The study aims to: Determining the level of nitrogen and iron, which gives the highest production, the best kind and the most concentrated of medically active substances, and their interaction for the yellow corn crop.

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Materials and methods

A field experiment was carried out in Al-Jilawiyah region (30 km north of Babylon province) for the autumn seasons of 2020 and spring of 2021 in clay loam soil (Table 1)The factorial experiment was Randomized Complete Block Design (RCBD), experiment factors which are:-

- The nitrogen that was added in the form of urea CO (NH2) (46% active substance) was in three levels (two batches, three batches, four batches) and its symbol (N3,N2,N1), respectively.

Soil examination: samples were taken from the soil of the field before planting it at a depth of (0-30) cm and for more than one sample from places from which the sample was taken randomly and mixed and cleaned well and some chemical and physical tests were conducted on it according to the softness described by (Page et al., 1982) in the laboratories of the Soil and Water Department at Al-Qasim Green University (Table 1)The experimental land was tillage perpendicular with Moldboard plows , then smoothed, levelled and divided into experimental units with dimensions (4 x 3) = 12 m^2 and four furrows per unit. The distance between one rice and another is 75 cm and between pit and another 25 cm at average of (2-3) grains of one quality, then leave a distance of 1 m between an experimental unit and another and 2 m between one replicate and another to ensure that the spraying is conducted correctly. The two middle values were taken to study the required traits and nitrogen was added at a rate of 320 kg N.ha^{-1}. At the first level, it was in two batches, the first after 20 days of germination and the second before flowering. As for the second level, it was in three batches, the first after 20 days of planting and the second after 20 days of the first and third batches at the beginning of flowering. As for the third level, it was added in four batches according to the following (15, 30, 45, 60) days from planting, As for the addition of iron, it was sprayed on the leaves at sunset until completely wet twice (the first after a month of germination and the second before flowering) before carrying out the spraying and iron process, the field is irrigated one day before for the purpose of opening the stomata for transpiration, and with the racists, the substance of (dish washing solution)is added for the purpose of reducing the surface tension on the leaves. corn seeds were planted from the cultivar Al-Furat Hybrid, whose seeds were obtained from the Agricultural Research Directorate / Baghdad for the autumn season of 2020 on 7/15/2020, and for the second spring season of 2021 on 3/15/2021.In both seasons, the bush was controlled with atrazine (80% active substance) and 4 kg.ha-1 before germination, while continuing the weeding process as needed. The corn stem borer Sesamia Criteca was controlled using granulated diarinon (10% active substance) at a rate of 6 kg.ha-1 by feeding the plants twice, the first time after 20 days of planting and the second two weeks after the first control. All crop service operations were conducted (Glo, 2016).The vegetative growth traits were measured after taking (10) plants from the two middle lines, which are:

1) Number of rows in cob: The number of rows in the cob is calculated for ten plants and the result is divided by 10

2) The number of grains in a row: The number of grains in each row is calculated for each of the ten grooves that are randomly taken.

3) Weight of 500 grains: (gm) and it is calculated from the yield of kernels used in studying the components of the yield after correcting the weight to the moisture content of 15.5 (Al-Sahoki, 1990).

4) Phynolic Contant

5) Clucose /mays Silk

6) Fructose

These compounds have been diagnosed with accreditation High performance liquid chromatography (HPLC)

statistical analysis

The data were statistically analyzed using analysis of variance and according to the randomized complete block design (RCB D) for factorial trials, and the arithmetic means of treatments were compared using the least significant difference (LS D) at a probability level of 0.05 using the statistical analysis program Genstate.

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Table (1) Some physical and chemical properties of the soil in which the research was conducted.

Spring season	Autumn season	units	traits	No.
2.07	2.4	ds.m2	Ec	1
7.25	7.10		pH	2
1.52	1.33	$kg.kg^{-1}$ soil	organic matter	3
51.27	48.11	$mg.kg^{-1}$ soil	N availability	4
13.25	11.27	$mg.kg^{-1}$ soil	P availability	5
76.22	70.70	$mg.kg^{-1}$ soil	K availability	6
112	98	$g.kg^{-1}$	Clay	7
407	445	$g.kg^{-1}$	sand	8
461	457	$g.kg^{-1}$	silty	9
		silty sandy loam	texture	10

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Results and discussion

Number of rows in cob (row / cob)

Table (1 and 2) showed, there are significant differences between the levels of ground nitrogen fertilization and manganese for the number of rows in cob for the autumn and spring seasons.As for their bi-interactions, the interaction between nitrogen and iron was significantly different for the autumn season, while for the spring season, the interaction between nitrogen and iron was not significant. Tables (2 and 3) indicated that the third level of nitrogen fertilization N3 was significantly excelled on the rest of the levels by giving it the highest average of the trait for both the autumn and spring seasons, which amounted to (818.4, 17.65) row/cob , respectively. While the first level N1 gave the lowest average for the trait, which was (13.75, 13.81) row / cob for the autumn and spring seasons, respectively. Al-Nasrawy's results (2015) supported the increase in nitrogen fertilization, an increase in the number of rows in cob, justifying this by increasing the speed and division of meristematic tissue cells and increasing the leaf area and thus increasing the area exposed to light and improving the growth conditions, which is ultimately reflected in the increase of the studied trait.. These results agreed with Al-Jubouri (2010).When adding iron, the Feo level significantly excelled on the rest of the levels by giving it the highest average for the trait that reached (16.60, 16.23) row/cob for the autumn and spring seasons, respectively, while the Feo level gave the lowest averages for the trait amounting to (15.22, 14.96) row/corn for the two autumn seasons. and spring, respectively.As for the interaction between nitrogen and iron, the combination Fe2XN3 was significantly excelled by giving it the highest mean of (19.15, 18.38) row/ear for the autumn and spring seasons, respectively. While the combination Feo X N1 gave the lowest averages for the trait amounted to (13.23, 13.33) row/cob for the autumn and spring seasons, respectively and these results agreed with Salem (2017) justifying that "when absorbing nitrogen in large quantities, this will lead to an increase in the content of chlorophyll in the leaves and an increase in the leaf area, and when interacting with iron, the latter increases the efficiency of vital processes in the plant as it enters the composition of enzymes that have a role Significant increase in a number of traits, including increasing the length of the ear, and these results agreed with Al-Zayni (2013).

Table (2) The effect of adding iron nitrogen fertilizers and their bi-interactions on the trait of number of rows in cob of the corn crop for the autumn season of 2020

N average	Fe 2	Fe1	Fe 0	Fe / N
13.75	14.21	13.83	13.23	**N1**
15.53	16.45	15.55	14.62	**N2**

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18.48	19.15	18.48	17.82	**N3**
	16.60	15.95	15.22	**average**
0.4109 0.7118				**L.S . D**

Table (3) The effect of adding nitrogen and iron fertilizers and their bi-interactions on trait of the number of rows in the cob of the corn crop for the spring season of 2021.

N average	**Fe 2**	**Fe1**	**Fe 0**	**Fe / N**
13.81	14.43	13.62	13.33	**N1**
15.22	15.89	15.19	14.58	**N2**
17.65	18.38	17.63	16.96	**N3**
	16.23	15.50	14.96	**average**
0.4729		0.8190		**L.S . D**

Number of grains in a row (grain/row)

Table (2) indicate that there are significant differences between the levels of ground nitrogen fertilization and iron spraying for the number of grains per row for the autumn and spring seasons. As for their bi-interactions, the bi- interactions between iron and nitrogen were not significant in the autumn season only. As for the spring season, the bi- interaction between iron and nitrogen was significant. Tables (4 and 5) show the effect of adding nitrogen fertilizers to maize crop on traits of the number of grains in the row. The N3 level was significantly excelled, giving the highest averages for the studied traits amounting to (38.30.38.39) grains/row for the autumn and spring seasons, respectively, while the N1 level gave less The averages for the trait amounted to (27.14 27.39) grains/row for the autumn and spring seasons, respectively. The results agreed with the findings of Al-Nasiri and Al-Abdullah (2020), where he justified the increase in the number of grains per row when the percentage of absorbed nitrogen was increased because the latter activates the division of silk cells in the peripheral region of cob and thus leads to the early emergence of silk threads at the same time, the pollen grains are ready for pollination, which leads To pollinate the ovaries of that area of the cob and thus increase the number of grains in the row. The results agreed with the findings of Hnamtc et al. (2016). As for the effect of added iron, the Feo level outperformed the rest of the levels by giving it the highest average for the trait, which amounted to 34.63 and 34.31 grains/row for the fall and spring seasons, respectively. As for the Feo level, it gave the lowest averages for the trait, amounting to (30.50, 29.67) grains/row for the autumn and spring seasons, respectively. The results were supported by Al-Zayni, 2013, justifying the increase in the number of grains per row as a result of adding iron as the latter increases the content of chlorophyll pigment by increasing the rate of two processes Photosynthesis and respiration, which leads to an improvement in the vegetative growth condition of the plant, and consequently, an increase in the number of grains per row.The results are in agreement with the findings of Al-Tamimi (2017).As for the interaction showing nitrogen and iron fertilization, the combination of N3 X Fe2 was significantly excelled by giving it the highest averages, amounting to (40.80, 41.95) grains/row. While the combination N1 X Fe2 gave the lowest averages for the trait (25.35, 25.40) grains/row for the spring season.

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Table (4) The effect of adding nitrogen and iron fertilizers and their bi-interactions on trait of the number of grains per row (grain. row) of corn for the autumn season of the year 2020.

N average	Fe 2	Fe 1	Fe 0	Fe / N
27.14	28.81	27.27	25.35	**N1**
32.25	34.29	32.22	30.26	**N2**
38.30	40.8	38.24	35.90	**N3**
	34.63	32.52	30.50	**average**
1.315			2.277	**L.S.D**

Table (5) The effect of adding nitrogen and iron fertilizers and their bi- interactions on trait of the number of grains per row (grain. row) of corn for the spring season of 2021.

N average	Fe 2	Fe 1	Fe 0	Fe / N
27.39	29.44	27.34	25.40	**N1**
29.42	31.55	29.13	27.58	**N2**
38.93	41.95	38.82	36.03	**N3**
	34.31	**31.76**	**29.67**	**average**
0.493			0.854	**L.S.D**

Weight 500 grain (g)

the result showed that significant differences were found between the levels of ground nitrogen fertilization and the iron element added by spraying on the leaves for weight of 500 grains for the autumn and spring seasons. As for the bi-interactions between iron and nitrogen, the differences were significant for the studied trait and for the autumn and spring seasons.From tables (6) and (7), it is clear that the N3 level was significantly excelled to nitrogen fertilization for the autumn and spring seasons, which amounted to (120.41 and 117.26) g / grain, respectively, while the level N1 was given the lowest averages for the autumn and spring seasons, which amounted to (86.98, 85.95) g / grain. The results agree with Al-Hassan (2011) and Al-Nasiri and Al-Abdullah (2020) with the latter justifying the increase in the grain weight by increasing the plant's absorption of nitrogen, the leaf area will increase, and thus the efficiency of the photosynthesis process will increase, so the grains will be more equipped with their requirements of processed food, so they become autumn and increase in size and weight .The results agreed with Sharma et al. (2017) When adding iron, the level of Fe2 was significantly characterized by giving it the highest average for the trait, which amounted to (109.77, 107.72) g/grain for the autumn and spring seasons, respectively. While the Feo treatment gave the lowest averages for the trait (91.31 and 88.96) g/grain for the Autumn and spring seasons, respectively. The results agree with what was reached by Orhtum (2013) justifying the increase in the weight of the grain by adding iron, since the latter increases the content of chlorophyll in the leaves and has a role in building this pigment, thus increasing the average of the processes of respiration and photosynthesis, which increases the vital activities of the plant and thus increases the weight of the grain.As for the bi-interaction between nitrogen and iron, the combination of Fe2 X N3) significantly excelled by giving it the highest average for the trait amounted to (133.44, 132.17) g/grain for the autumn and spring seasons, respectively.As for the combination (Feo X N1), the lowest averages for the trait were given (81.89 and 81.33 g/grain for the autumn and spring seasons, respectively).

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Table (6) Effect of adding ground nitrogen and spraying iron and their bi-interactions on the trait of weight of 500 grains of corn crop for the autumn season of 2021

N average	Fe 2	Fe 1	Fe 0	Fe / N
86.98	92.03	87.04	81.89	**N1**
95.20	103.76	94.92	87.55	**N2**
120.41	133.44	123.32	104.49	**N3**
	109.77	101.76	91.31	**average**
		1.973	3.417	**L.S.D**

Table (7) The effect of adding ground nitrogen and iron and their binary interactions on the weight of 500 grain of corn crop for the spring season of 2021

N average	Fe 2	Fe 1	Fe 0	Fe / N
85.95	90.33	86.19	81.33	**N1**
92.67	100.66	91.34	86.02	**N2**
117.26	132.17	120.12	99.52	**N3**
	107.72	**99.22**	**88.96**	**average**
	1.705	3.269		**L.S.D**

Sucrose percentage (%)

Annexes (1) and (2) indicated that there were significant differences between the levels of nitrogen fertilization and the spraying of elements of iron for the sucrose percentage in corn for the autumn and spring seasons.Table (8) and (9) showed that treatment N2 was significantly excelled on the rest of the levels, giving the highest mean for the studied trait amounting to 19.40, 18.64 % for both autumn and spring seasons, respectively. While the N1 level gave the lowest averages for the trait amounted to (17.80, 17.87)% for both autumn and spring seasons, respectively. When iron was added, the treatment Fe2 was significantly excelled by giving it the highest mean of the trait, which amounted to 19.24 and 18.60% for both autumn and spring seasons, respectively. While the treatment Feo gave the lowest averages for the trait amounted to (18.24, 17.80)% for both the autumn and spring seasons, respectively.As for the interaction between nitrogen and iron, the combination (N2 X Fe2) was excelled by giving it the highest average for the trait, which amounted to 20.13 and 19.01% for the fall and spring seasons, respectively. Whereas, treatment (N1 X Fe0)) gave the lowest averages for the trait, which were 17.46 and 17.46 for the autumn and spring seasons, respectively.

Table 8)) The effect of adding ground nitrogen fertilizer and spraying micro-elements (iron and manganese) and their bi and triple interactions on the sucrose trait of corn for the autumn season of 2020

N average	Fe 2	Fe 1	Fe 0	Fe / N
17.80	18.15	17.80	17.46	**N1**
19.40	20.13	19.41	18.68	**N2**
19.01	19.44	19.01	18.59	**N3**
	19.24	**18.74**	**18.24**	**average**
0.573			0.911	**L.S.D**

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Table (9) The effect of adding ground nitrogen fertilizer and spraying micro-elements (iron and nitrogen) and their bi- interactions on Sucrose in corn for the spring season of 2021

N average	Fe 2	Fe 1	Fe 0	Fe / N
17.87	18.31	17.85	17.46	**N1**
18.64	19.01	18.65	18.26	**N2**
18.07	18.47	18.04	17.69	**N3**
	18.60	**18.18**	**17.80**	**average**
0.351			0.609	**L.S.D**

Phynolic Contant Percentage (%) of phenolic compounds

Annexes (1) and (2) show significant differences between the levels of ground nitrogen fertilization and iron spraying for the percentage of phenolic compounds in corn for the autumn and spring seasons.From tables (10) and (11) it is clear that treatment N3 is significantly excelled on the rest of the levels, giving the highest mean for the studied trait that reached (45.31, 41.40) for both autumn and spring seasons, respectively. While the N1 level gave the lowest averages for the trait amounted to (37.09, 34.12%) for both the autumn and spring seasons, respectively. The results agreed with the findings of Al-Amin (2019).While the treatment Fe2 significantly excelled and gave the highest mean of the trait amounted to (43.05, 38.66)% for both autumn and spring seasons, respectively. While the treatment Feo gave the lowest averages for the trait (39.70, 35.48) for both autumn and spring seasons, respectively. The results agreed with the findings of Ali (2012).As for the bi-interaction between nitrogen and iron, the combination (N3 X Fe2) significantly excelled by giving it the highest mean of the trait amounted to (47.00, 44.53)% for the autumn and spring seasons, respectively. While the treatment Feo X N1) gave the lowest averages for the trait that reached (35.63, 33.18) for the autumn and spring seasons, respectively.

Table (10) Effect of adding ground nitrogen fertilizer and iron spray and their bi-interactions on a trait in Phynolic Content in corn calories for the autumn season 2020.

N average	Fe 2	Fe 1	Fe 0	Fe / N
37.09	38.54	37.12	35.63	**N1**
41.71	43.60	41.66	39.87	**N2**
45.31	47.00	45.34	43.60	**N3**
	43.05	**41.37**	**79.70**	**average**
0.698			1.209	**L.S.D**

Table (11) Effect of adding ground nitrogen fertilizer and iron spray and their binary interactions on Phynolic Contanta in yellow corn calories for the spring season 2021.

N average	Fe 2	Fe 1	Fe 0	Fe / N
34.12	35.32	33.89	33.18	**N1**
35.12	36.10	34.77	34.51	**N2**
41.40	44.53	40.77	38.92	**N3**
	38.66	36.48	35.48	**average**
0.671			1.162	**L.S.D**

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Fructose percentage (%)

It is clear from the annexes (1) and (2) that there are significant differences between the levels of nitrogen fertilization of the ground and iron foliar spraying for traits of the percentage of Fructose in corn and for the autumn and spring seasons, while the bi- interaction of the added elements was significant for the autumn and spring seasons.From Table (12) and (13) the level of N3 significantly outperformed the rest of the levels by giving it the highest mean of the studied trait amounted to (19.11, 18.59)% for the autumn and spring seasons, respectively. While the N1 level gave the lowest averages for the trait amounted to (17.29, 16.20) for both the autumn and spring seasons, respectively. The results are in agreement with the findings of Abaka (2017).When iron was added, the treatment Fe2 was significantly superior by giving it the highest mean of the trait (18.63, 17.80) for both autumn and spring seasons, respectively. As for the level that gave the lowest averages for the studied trait, Feo, it gave (17.57, 16.89) for both the autumn and spring seasons, respectively. The results agreed with the findings of Al-Zubaidi (2017)As for the bi-interaction between nitrogen and iron, the combination (N3 X Fe2) was characterized by giving the highest mean for trait (19.72, 19.21) for the autumn and spring seasons, respectively. While the treatment Feo X N1) gave the lowest averages for the trait reached (16.88, 15.90) for the autumn and spring seasons, respectively.

Table (12) Effect of adding ground nitrogen fertilization and iron spraying and the bi- interaction between iron and nitrogen on the trait of Fructos in corn calories for the autumn season of 2020.

N average	Fe 2	Fe 1	Fe 0	Fe / N
17.29	17.79	17.23	16.88	N1
17.74	18.39	17.59	17.26	N2
19.11	19.72	19.03	18.58	N3
	18.63	17.95	17.57	average
0.1750			0.2846	L.S.D

Table (13) The effect of adding ground nitrogen fertilization and iron spraying and the bi- interaction between nitrogen and iron on the corn fructos for the spring season of 2021.

N average	Fe 2	Fe 1	Fe 0	Fe / N
16.20	16.51	16.19	15.90	N1
17.14	17.68	17.06	16.70	N2
18.59	19.21	18.50	18.06	N3
	17.80	17.25	16.89	average
0.1571			0.2721	L.S.D

Annex (1) Table of analysis of variance using mean of squares (MS) for the studied traits in the autumn season of 2020 (B)

fructose percentage	glucose percentage	Weight 500 grains	Number of grains per row	Number of rows by cob	phenolic compounds	df	source of variation
0.000372	0.001100	5.35	43.497	6.9931	4.244	2	replicates
7.744712*	6.69534*	*2315.78	*120.336	*12.0923	176.403*	2	N

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24.125275*	18.80021*	*8134.01	*820.487	152.0976*	86.646*	2	Fe
0.053820*	0.36633*	*226.24	غ م 0.983	* 0.5518	417.407*	4	N X Fe
0.004415	0.01142	13.05	5.794	0.5662	1.635	52	experimental error

Annex (2) Table of analysis of variance using mean of squares (MS) for the studied traits in the spring season of 2021 (B)

Oil percentage	Fructose	Sucrose	Number of rows by cob	Weight 500 grains	Number of grains per row	Df	source of variation
0.007009	0.28301	0.005211	1.7779	68.56	8.1100	2	**replicates**
1.557127*	6.88674*	4.283693*	13.0622*	3959.89*	148.2617*	2	**N**
2.930312*	40.29434*	4.281100*	107.5146*	55.78.30*	1031.6086*	2	**Fe**
0.179262*	0.29001*	0.008276*	0.0113 Ns	505.77*	3.1714*	4	**N X Fe**
0.08294	0.5985	0.004150	0.7497	60.17	0.8145	52	**experimental error**

References

1. Al-Ani and Ahmed Salman Hamad. 2018. Effect of humic acid and bacterial biofertilizer And nitrogen in the readiness of some nutrients and the growth and yield of yellow maize PhD thesis. faculty of Agriculture . Baghdad University . p. 180.

2. Al-Tamimi, Atheer Hisham Mahdi. 2017. Response of some synthetic varieties of Yellow Corn (Zea mays L.) for Mineral and Organic Fertilizer and vitality. Master's Thesis, College of Agriculture, University of Baghdad. p 106

3. Ali Noureddine Shawky. 2012. Fertilizer technologies and their uses. University house For printing, publishing and translation. Baghdad University . Ministry of Higher Education and scientific research. Iraq

4. Abka, Ahmed Sadiq Jaafar (2017). The effect of the variety and spraying with acid Humic in the growth and productivity of yellow corn. Zea mays L And the calorie content of some effective compounds, a master's thesis. College of Agriculture - Al-Qasim Green University.

5. Al-Nasiri Yahya Abdul-Razzaq Mohan and Sindi Abdul-Karim Al-Abdullah. 2020. Study of the growth and yield of yellow corn Zea Mays L. under levels of nitrogen and potassium fertilization. Al-Muthanna Journal of Agricultural Sciences. Volume (8) Issue 1 of 2020

6. Al-Hassan, Ali Sabah Ali. 2011. Effect of nitrogen fertilizer and plant densities on growth, yield and some of its components. Maize Zea mays L. Al-Qadisiyah Journal of Agricultural Sciences 1(1): 1-8.

eISSN 1303-515

7. Al-Zubaidi, Najm Abdullah and Ayman Ahmed Abdel-Karim Al-Abbasi. 2015. Effect of potassium and iron foliar feeding on vegetative growth characteristics of maize (mays L Zea) under drip irrigation system.
8. Al-Amin, Muhammad. 2018 . Nitrogen is important for plants. Training course for Al-Huda Agricultural Corporation. Feb 27.
9. Al-Roumi, Abdul Karim Hussein 2017. Response of maize cultivars to different levels of nitrogen fertilization - Journal of Karbala University 150(2):9-15.
10. Al-Nasrawi, Abdul Karim Hussein Romi. 2015. Assessment of the response of the genotypes of yellow corn (Zea mays L.) produced by cross-crossing and its parents to nitrogen fertilization.

11. Al-Zayni, Kholoud Naji Attia. (2013). Effect of spraying with iron and zinc on the growth and yield of yellow maize (mays L Zea). Master Thesis . faculty of Agriculture . University of Babylon . Iraq
12. Al-Jubouri, Omar Abdel-Mawgoud Abdel-Qader. 2010 . Effect of Bio-fertilizer (EM1) and Nitrogen Fertilization on Growth Characteristics and Yield of Maize (Zea mays L.), Master Thesis, University of Mosul, College of Agriculture and Forestry

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