Evaluation of the performance of some cultivars of corn (*Zea mays* L.) in three planting dates .

Ali Oday AL-Fatlawy* , Ali Hussein Khaleel , Hayder A.K Merjan , Ayad Waad Alenawey , Mustafa Sarab Ali

Babylon Agriculture Directorate

Ali1990oday@gmail.com*

Abstract

The field experiment for the 2019-2020 season was conducted in the farmer's field (Malik Jigan) in AL-Mahaweel (Dulaimi) area of Al- Mahaweel Agriculture Division in Babylon province,According to a randomized complete block design (R.C.B.D) and with three replications as a factorial experiment, the study included different planting dates (July 25 - August 5 - August 15) and several cultivars are hybrids (American Pioneer - Yugoslavian Zp) and the local cultivar(Bohuth 106). The experiment aimed to evaluate and study yellow corn cultivars under different planting dates. The results were as follows:

The July 25 date was significantly excelled in most vegetative growth traits and all yield traits and components, plant height, cob leaf area, number of grains per ear, the weight of 500 grains and grain yield, and increased by percentages of 7%, 33.5%, 25.4%, 20.2% and 80.4 % compared to the August 15 treatment, While the Pioneer cultivar was superior in the characteristics of stem diameter, number of grains per cob, weight of 500 grains, and yield ton/ha with an increase of 7%, 13%, 17.8% and 100% compared to Bohouth 106.While the cultivar Bohouth 106 significantly excelled in the cob leaf area with a percentage increase of (11.5%) compared to the American Pioneer cultivar, The date of August 15 did not give any significant difference in the traits of the yield, and the results showed a significant effect of the interaction values between the study factors in most of the traits. The interaction (25 July × Bohouth 106) gave the highest mean for the trait (plant height, cob area leaf, number of grains per cob and weight of 500 grains)Where the percentage increase was 14.6%, 52.8%, 63.9% and 89.6%, respectively, compared to the interaction (August 15 x Bohouth 106), while the interaction (July 25 x Pioneer) excelled by 314.17% over (August 15 x Bohouth 106).It was concluded from this study that the date of planting July 25th is the appropriate date for planting hybrid and local cultivars due to the sufficient thermal accumulation that leads to an increase in the production of dry matter and its transfer from the source to Sink , Whereas, the Pioneer cultivars gave the best results in terms of the economic yield due to its excelled in the components of the yield, compared to the Bohouth 106 cultivar, which gave the lowest yield.

Introduction

corn Zea mays L. is a cereal crop of great economic importance due to its high nutritional value, whether for humans or animals, and its entry into many areas of use, foremost of which is the production of animal feeds, starch industry, direct human consumption or oil. corn is grown on a very large scale in the world and comes in third place after wheat and rice crops in terms of area and global production. According to the statistics of the Food and Agriculture Organization (FAO).The cultivated area in the world in the year 1920 reached (238,413,969) hectares with a productivity rate of (4,859 tons. .ha-1. The rate of corn production per unit area in Iraq is still low compared to the world average or the agriculturally developed countries of the world such as the United States, Canada and the Arab Republic of Egypt (Al-Mamouri, 1997) This decline requires searching for new means to increase and improve production in terms of quantity and quality. One of these means is the use of

newly derived cultivars in Iraqi agriculture and introduced hybrids that respond to a high degree to soil and crop service operations and other environmental factors. Many researchers indicated that the importance of planting dates lies in determining the ability of maize hybrids to give high yield Norwood (2001) and Darby & Lauer (2002) Lee & Tollenaar (2002) and Garcia & Hoogenboom (2009) and Saseendran et at (2005) That corn hybrids differ in their ability to photosynthesis, individual productivity and many traits, between Voskoboynik, (2005) that environmental conditions play an important role in determining the productivity of corn and this requires determining the appropriate environmental and agricultural conditions for growing this crop, foremost of which is the date of planting This was confirmed by Capristo & Andrade, (2007) and Perez-Bidegain et al(2007).As a result of the continuous updating in the development and introduction (import) of hybrids, genotypes and cultivars for the corn crop, we decided to conduct this research to assess the growth and productivity of this crop for the variety Bohuhat 106 and the American hybrid (Pioneer) and Yugoslavian (Zp) under the influence of different planting dates.

Materials and methods

The field experiment was conducted for the 2019-2020 season in the field of farmer Malik Jigan in the Mahaweel (Al-Dulaimi) area of Al-Mahaweel Agriculture Division in the Babylon province, which is located 40 km north of the city of Hilla. hybrid seeds were obtained from agricultural offices and seeds of the local cultivar from the Research Department agricultural, The land was prepared for cultivation by tillage , smoothing and leveling it, adding DAP fertilizer 50 kg / dunum with tillage and adding urea fertilizer 50 kg / dunam Al-Fatlawi, (2016) in two batches, the first after the appearance of the fifth and second leaves, the beginning of the flowering phase Shukla & (2010), Chandl. The experiment was conducted according to a randomized complete block design (RCBD) as a factorial experiment (3 × 3) with three replications.Each replica was divided into 9 experimental units with dimensions of 3 x 3 m. Each experimental unit included five lines, the distance between one line and another 75 cm. The seeds were planted in small holes, the distance between one hole and another was 25 cm by placing (2) seeds in each hole.The study included two factors, the first: different planting dates (July 25 - August 5 - August 15) and the second factor: varieties that include two hybrids (American Pioneer - Yugoslav Zp) and the local cultivar(bohuth106).

Studied traits:

Vegetative Growth traits :

10 plants were taken randomly from each experimental unit of the corn crop, and the guard plants were excluded to study the vegetative traits when the flowering stage was completed, as follows:

1- Plant height (cm):

It was measured by calculating the height of the plant from the level of the soil surface to the top of the inflorescence, using a graduated measuring tape Al-Sahuki tape, (1990).

2- stem Diameter (cm):

The stem diameter was measured after the second node on the stem from the soil surface by Vernier Al-Sahoki (1990).

3- The cob leaf area (cm2):

It was measured by measuring the length and width of the cob leaf using a graduated ruler from the median lines, and it was calculated according to the following relationship:

Paper area = maximum paper length x maximum paper width x 0.75 Al-Shukla, (2010).

traits of the yield and its components.

After the completion of the maturity of the plants, the components of the yield were

measured. These traits were calculated for ten guarded plants from each experimental unit, taken randomly, specifically the following traits:

1- The number of grains per cob .

The number of grains in cob was calculated for each of the ten plants, then their average number was taken.

2- The weight of 500 grain (gm)

It was calculated after neglecting all the kernels for the ten plants, a random sample of their grains was taken and 500 grains were counted and weighed with a sensitive scale after correcting the weight for the moisture content of 15%. AL-Sahuki (1990).

3- Total yield (corn) ton.h^{-1}

According to the average weight obtained from the stalks of one plant after being air dried. Then convert to tons. ha^{-1}.

● The percentage increase was calculated according to the following equation

Percentage increase = highest value - lowest value / lowest value x 100

● The data was analyzed statistically using the statistical analysis program (GenStat).

The means were compared for the least significant difference LSD Least Significant Difference at the 0.05 probability level.

Results and discussion :

1- Plant height:

The results of Table (1) showed that there were no significant differences between the cultivars in the trait of plant height, while the date of July 25th was significantly excelled by giving it the highest average plant height of 285.2 cm compared with the dates August 5 and August 15,This is due to the appropriate temperatures, in addition to the length of the growth period when planting on July 25, which allows the plant to give huge vegetative growth, and this is consistent with Maresma, et al., (2019),While the second date, August 5, excelled on the date August 15, by giving them the averages of 276.2 and 266.4 cm, respectively, while the interaction (25 July × Bohouth 106) significantly excelled by giving it the highest average of 298.3 cm.Compared to most of the interactions, where the height of the plant decreases as the planting dates move towards August, that is, all cultivars had the highest levels of the plant in them from the first planting date (July 25) and the plant height began to decrease gradually The more planting dates move towards August and the lower the height of the plant and for all cultivars at the date of August 15.

Table (1): Effect of planting dates and cultivars on plant height (cm).

Planting dates	cultivars			average
	Pioneer	Zp	Bohouth 106	
July 25	280.0	277.3	298.3	285.2
August 5	277.7	276.3	274.7	276.2
August 15	270.3	268.7	260.3	266.4
average	276.0	274.1	277.7	
LSD 0.05	cultivars = N.S dates = 7.33 interaction = 14.66			

2- stem diameter :

The results in Table (2) showed the superiority of the hybrid Pioneer in the characteristic of stem diameter by giving it the highest average of 2.59 cm compared with the hybrid Zp, It did not differ significantly from the cultivar bohuth 106, and the reason for this is due to the difference in genetic structure between hybrids and cultivars. While there were no significant differences between planting dates, while the interaction (August 5 x bohuth 106) was significant by giving it the highest average of 2.70 cm compared to most of the interactions.

Table (2): Effect of planting dates and cultivars on stem diameter (cm).

Planting dates	cultivars			average
	Pioneer	Zp	Bohouth 106	
July 25	2.50	2.40	2.58	2.49
August 5	2.66	2.20	2.70	2.52
August 15	2.61	2.20	2.00	2.27
average	2.59	2.26	2.42	
LSD 0.05	cultivars = 8 0.30 dates = N.S interaction = 0.616			

3- The cob leaf area :

The results in Table (3) showed the cultivar Bohuth 106 excelled in the traits of the cob leaf area of the ear by giving it the highest average of 522.3 cm2 compared with the cultivar Pioneer, which did not differ significantly with the cultivar Zp. ,(2018),Whereas, the date of July 25th was significantly excelled by giving it the highest average of 558.8 cm2 compared with the other dates. This is due to the length of the growth period, which caused an increase in the rates of photosynthesis, which increased the growth and expansion of leaves, including Lizaso, et al., (2018),While the date of August 15th decreased significantly by giving it the lowest average of 418.6 cm2, the interaction (25 July × Bohuth 106) was significantly excelled by giving it the highest average of 625.0 cm2 compared to the other interaction.

Table (3): The effect of planting dates and cultivars on the cob leaf area (cm2).

Planting dates	cultivars			average
	Pioneer	Zp	Bohouth 106	
July 25	489.8	561.7	625.0	558.8
August 5	494.8	506.5	532.5	511.2
August 15	420.5	426.1	409.3	418.6
average	468.3	498.1	522.3	
LSD 0.05	cultivars = 37.08 dates =37.08 interaction= 74.16			

4- Number of grains per cob:

The results in Table (4) showed the Pioneer cultivar excelled by giving it the highest average number of grains per cob, which amounted to 585.4 grains/cob, compared with the local cultivar, due to the difference in genetic structure between the cultivars Kubaisi and Bektaş (2011),While the July 25 date excelled it by giving it the highest average of 606 compared to the other dates. The reason for this is due to the increased interception of light from the leaves, and then an abundance of dry materials manufactured by photosynthesis, which enabled the plant to improve its performance in growth processes, which was reflected in the increase in the number of grains in the cob 3 This is in agreement with Al-Ma'ini and Al-Obaidi (2018), and the interaction (25 July × Bohouth 106) gave the highest average number of grains in cob, reaching 615.3 compared with the other interaction.

Table (4): The effect of planting dates and cultivars on the number of grains per cob (grain / cob).

Planting dates	cultivars			average
	Pioneer	Zp	Bohouth 106	
July 25	599.3	603.3	615.3	606.0
August 5	592.7	588.0	562.7	581.1
August 15	564.3	510.0	375.3	483.2
average	585.4	567.1	517.8	
LSD 0.05	cultivars = 19.56 dates = 19.56 interaction= 39.12			

5- Weight of 500 grain:

The results in Table (5) showed the Pioneer cultivar excelled by giving it the highest average weight of 500 grains, which amounted to 124.78 gm compared to the bohuth106 cultivar, and it did not differ significantly with the Zp hybrid, this difference is due to the difference between the genotypes This is consistent with what was found by Al-Asafi, (2005), while the date of August 15th decreased significantly by giving it the lowest average weight of 500 grains 105.56 gm compared with the dates July 25 and August 5, which gave the highest averages of (126.89 and 121.67) gm, respectively .This confirms the temporal compatibility with regard to heat and light, which was ideal for growth rates and the manufacture of photosynthetic products at the highest rates, which was positively reflected in most of the traits of vegetative growth, which led to an increase in the weight of grain, and this is consistent with Ahmed, (2001),While the interaction (25 July × bohuth106) gave the highest average of 127.67 g compared with most of the other interactions.

Table (5): Effect of planting dates and cultivars on the weight of 500 grains (gm).

Planting dates	cultivars			average
	Pioneer	Zp	Bohouth 106	
July 25	127.33	125.67	127.67	126.89
August 5	126.67	124.67	113.67	121.67
August 15	120.33	120.00	76.33	105.56
average	124.78	123.44	105.89	
LSD 0.05	cultivars =2.823 dates = 2.823 interaction= 5.64			

6- yield - cob ton/ha:

the results in Table (6), the Pioneer cultivar excelled by giving it the highest average yield of 9.616 tons/ha, compared with the hybrid Zp and bohuth106, which gave the averages 9.056 and 4.803 tons/ha, respectively.The reason for this is due to the excelled of the cultivar in the number of grains per cob and their weight in Table (4 and 5), while there was a significant increase on the date of July 25, which gave the highest average yield of 9.672 tons/ha compared to the dates August 5 and August 15, which gave the averages (8.441 and 5). .361) tons/ha, respectively, The grain yield increases by increasing one or more of its components. It is noted in Table (4) that this date was significantly excelled in the number of grains in the ear, which was reflected in the increase in grain yield at this date, in addition to its superiority in most vegetative growth traits, Table (3.1),The decrease in the yield on the date of August 15th is a result of the decrease in temperature and the lack of photoperiod at the flowering stage, and at the stage of growth and fullness of grain, which affected the decrease in the components of the yield and the fertility rate.This was reflected in the reduction of grain yield and this result is in agreement with what was found by Baktash, 1974 and Otegui & Melon, (1997), while the interaction (25 July × Pioneer) gave the highest average of 11.107 tons/ha compared with most of the other interaction.

Table (6): Effect of planting dates and cultivars on yield - cob ton/ha.

Planting dates	cultivars			average
	Pioneer	Zp	Bohouth 106	
July 25	11.107	10.810	7.100	9.672
August 5	10.417	10.283	4.623	8.441
August 15	7.323	6.073	2.687	5.361
average	9.616	9.056	4.803	
LSD 0.05	cultivars = 0.4871 dates = 0.4871 interaction= 0.974			

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