The Effect of Planting Distances in Several Genotypes of Yellow Maize (Zea Mays L.)

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Abstract

Two field experiments were carried out in Abi Gharaq, Al-Masaleeb in Autumn season, 2020 and Spring season, 2021 in the fields of Technical college/ Musayyib for finding out the effect of planting distances in several genotypes of yellow maize (Zea Mays L.). Five genotypes are used as parents and the first one of it is used in planting the second season and in three experimental units for both distancing and genotypes. The distances were (60cm, 70cm, and 80cm) among the species for each five species from each experimental unit (three experimental units) and the soil was structured for five genotypes. The characteristics of the crop and its ingredients (the average number of kernels in the plant, the average kernel height(cm), the average number of rows in a kernel, the average number of seeds in a row, the average number of kernel seeds, the average weight of 300 seeds (gm), and the average crop seeds for the plant (gm)/ a plant) are studied for each experimental unit. The data are analyzed statistically for each characteristic according to variance analysis and using a least significant difference test (LSD) under the level of 5% for autumn and spring seasons using the standard design for agricultural experiments (RCBD). The results have shown the excess of the first density in most of the characteristics studied. As for the species, the results have shown the excess of the first genotype over all other genotypes.

Keywords: Yellow maize, genotypes, planting distance

1. Introduction

Yellow maize (Zea Mays L.) is one of the crops that can be planted in two periods of time (autumn and spring) within the seed group. It can be used widely as livestock and cereals. It can also be used as cereal for humans and it can be made use of in producing many industrial products especially vegetable oils. The production of yellow maize (Zea Mays L.) crop was rated (1) thousand ton for Spring season whereas the production of yellow maize (Zea Mays L.) is rated (418.6) thousand ton, while the production of the yellow maize crop estimated for the autumnal boutonniere (418.6) thousand tons, at a rate of (99.8%) of the total area planted for the two boutonnière (419.3) thousand tons, (agricultural statistics directorate, 2020). In order to get better production of this crop, it is necessary to work on leveling up the efficiency of the production through finding out species and heterogeneous with high power of production and good quality specifications represented in oil and protein percentage. The crop is considered to be an important ingredient from the ingredients of the international food security [6]. The essential causes for the genetic environmental overlap are thought to belong to biochemical paths for some physiological processes which take place in plants. Although plants are similar in app kernelance, it remains different in some chain nucleotides. This leads to different expressions for genes in different environments and this is assured by [7]in studies done west and mid of Africa information on genetic environmental interference in yellow maize [5]. According to what previously mentioned, the study aims at finding out the effect of planting distances in several genotypes of yellow maize.

2. Materials and Methods

The res kernelch is done in Abi Gharaq, Al-Masaleeb in Autumn season, 2020 and Spring season, 2021 in the fields of Technical college/ Musayyib for finding out the effect of planting distances in several genotypes of yellow maize (Zea Mays L.). The soil of the field is analyzed for the two seasons before planting in the labs of Soil Department in the technical institute/ Musayyib by taking several random samples from different places of soil (0-30 cm) depth. The soil was dried and after that it gets loosened then it is mixed together and analyzed for two seasons. The results of the analysis has shown in Table (1):
Table 1. The analysis of soil for the two seasons of planting.

| The characteristics | The first season | The second season |
|---------------------|------------------|-------------------|
| EC                  | (3.54 ds.m⁻¹)    | 3.3 ds.m⁻¹        |
| pH                  | 7.2              | 7.1               |
| Texture             | (silty clay loam)| (silty clay loam) |
| Silty               | 205 (gm.kgm⁻¹)  | 535 (gm.kgm⁻¹)   |
| Loam                | 455 (gm.kgm⁻¹)  | 375 (gm.kgm⁻¹)   |
| Clay                | 340 (gm.kgm⁻¹)  | 90 (gm.kgm⁻¹)    |
| Nitrogen            | 78.5 (mgm kg⁻¹) | 96 (mgm kg⁻¹)    |
| Phosphorus          | 10.4 (mgm kg⁻¹) | 17.3 (mgm kg⁻¹)  |
| Potassium           | 2.3 (mgm kg⁻¹)  | 0.137(mgm kg⁻¹)  |
| Organic matter      | 2.2 (gm kg⁻¹)   | 1.1 (gm kg⁻¹)    |
| App kernel density  | 1.67(micagm.m⁻³)| 1.58(micagm.m⁻³) |
| Na⁺                 | 4.0              | 3.2               |

The genotypes shown in table(1) are used as parents and the first type of it is used in planting the second season in three experimental units for two yKernels (the distances and the genotypes). The distances were (60cm, 70cm, and 80cm) among the five species from each experimental unit (three experimental units) and for five genotypes the soil was structured.

Table 2. The genotypes used in the experiment with mentioning its symbols.

| The symbol | The genotype          | Its type                                  |
|------------|-----------------------|-------------------------------------------|
| 1          | Sarah                 |                                           |
| 2          | -1- Fajer             | A synthetic specie certified in Iraq.     |
| 3          | -3-  Bagdad           | It is got from agricultural               |
| 4          | Al-Muha               | committee for res kernelch                |
| 5          | 5018                  |                                           |

Planting was done within 900 square meters. The area was divided into three blocks, each block is divided into three experimental plots and each experimental plot is divided into five minor plots. The distance between the blocks is 1.5 meter. The length of the the minor experimental plot is 4 meters and 3 meters width to be 12 square meters. It has three four lines and the distance between the lines is 60 cm for the first 5 parameters. As for the the second five parameters, the distance was 70 cm and the third five parameters were 80 cm. The distances between the plants inside the experimental plot within each line is 25 cm. The required agricultural processes are done such as plowing, loosening, adjustment, and division of the area according to the experiment. The area of the experiment is fertilized with 400 kg of N.P.K: (1) It is added all in one when getting the area ready and urea fertilizer is added (46%N) with 400Kg. (2) In three times, the first one is after 20 days from emergence (20%), the second one after 40 days from emergence (30%), and the third one when flowering (50%).

Sesamia cretica Led was combatted using diazinon 10% by trimming Apical meristem for the plant two times. The first one is when the plant reaches six leaves and the second one after 20 days from the first combating. The necessary processes of the crop were applied including watering, weeding, and jungle combating. before harvest when needed, ten plants from each experimental plot was known randomly before starting to take the sizes. Considering not taking very small plants and then measuring all the characteristics. In the end of autumn season the kernels were harvested, dried, take it apart, kept for next spring season. The planting of spring season was done using the harvested genotypes and in the same way of autumn season. When the plants reaches the physiological maturity level, five random plants were taken from each genotype and for each block to study the characteristics of the crop and its ingredients: the average number of kernels in plants, the average height of the kernel (cm), the average number of seeds in the kernel, the average number of rows in the kernel, the average number of of seeds in a row, the average number of seeds of kernels, the average weight of 300 seeds (kg), and the average number of seeds of the plant (gm). The data were analyzed statistically for each characteristic according to variance analysis and using LSD under the level of 5% for the two seasons of spring and autumn using RCBD as mentioned kernellier [12].
3. Results and Discussion

3.1 Number of kernels

The results of table (3) pointed out that the first density of the average number of kernels exceeded (1.29 kernel. Plant 1). The lowest third density reached (1.15 kernels. Plant 1). As for the species, the third genotype had the highest average of the number of kernels in plant reaching (1.33 kernels. Plant 1) and the lowest number reaches (1.13 kernels. Plant 1) for the third genotype. As for the hybrid, the highest average number of kernels in hybrid plants (1*1) reaches (1.53 kernels. Plant number 1) and the lowest number of hybrid kernels was (3*3) and (5*3) reaching (1.00 kernels. Plant 1). As for the second season (spring), it is noticed that there are not big differences concerning density, but there are differences for species and interference between the species and densities for the characteristic of the number of kernels in yellow maize. The results have shown in table (3) the excess of third density and it was given the highest number of kernels in the plant reaching (1.15 kernels. Plant 1) and the lowest first density reaching (1.13 kernels plant 1). As for the other species, the fourth genotype reached the highest average number of kernels in plants (1.23 kernels. Plant 1) and the lowest for the first genotype reaching (1.00 kernels. Plant 1). As for the hybrid, the highest average number of kernels reached (1.27 kernels. Plant 1) for hybrid (2*2), (2*4), (3*3), and (4*3) and the lowest number was (1.00 kernels. Plant 1) for hybrid (1*1), (2*1), (3*1), (3*2), (2*3). The results agrees with [3-10].

Table 3. The average number of corn Kernels for species, plant densities, and interferences for the two seasons (autumn and spring).

| Species | Densities | The average species |
|---------|-----------|---------------------|
|         | 1         | 2                   | 3                   |                          |
| 1       | 1.53      | 1.20                | 1.27                | 1.33                     |
| 2       | 1.20      | 1.17                | 1.20                | 1.19                     |
| 3       | 1.27      | 1.13                | 1.00                | 1.13                     |
| 4       | 1.20      | 1.27                | 1.27                | 1.24                     |
| 5       | 1.27      | 1.40                | 1.00                | 1.22                     |
| LSD5%   | 0.11      |                     |                     |                          |
| The average density | 1.29 | 1.23 | 1.15 |
| LSD5%   | 0.11      |                     |                     |                          |

| Species | Densities | The average species |
|---------|-----------|---------------------|
|         | 1         | 2                   | 3                   |                          |
| 1       | 1.00      | 1.00                | 1.00                | 1.00                     |
| 2       | 1.20      | 1.27                | 1.00                | 1.16                     |
| 3       | 1.07      | 1.00                | 1.27                | 1.11                     |
| 4       | 1.17      | 1.27                | 1.27                | 1.23                     |
| 5       | 1.20      | 1.17                | 1.20                | 1.19                     |
| LSD5%   | 0.11      |                     |                     |                          |
| The average density | 1.13 | 1.14 | 1.15 |
| LSD5%   | NS        |                     |                     |                          |
3.2 The height of the top kernel

The results pointed out in table (4) the excess of the first density for the average height of the top kernel in the plant reaching (106.39 cm) and the lowest number reached (92.82 cm) for the third density. As for the species, the first genotype reached the highest average number of top height kernel in the plant (106.62 cm) and the lowest was (97.54 cm) for the third genotype. As for the hybrid, the highest average number of the top height kernel was (119.33 cm) for the hybrid (2*1) and the lowest was (84.03 cm) for the hybrid (3*1).

As for the second season(spring), it was noticed that there are big differences for densities, species, and interference among them for the characteristic of kernel top height for yellow maize. The results have shown in table (4) the excess of the first density and it was given the highest average number of top height kernel in the plant (96.06 cm) and the lowest number was (85.84 cm) for the second density. The species was having the highest average number of top height kernel in the plant (96.21 cm) for the fourth genotype and the lowest number for the first genotype was (83.71 cm). As for the hybrid, the highest average number of top height kernel in the plant was (116.94 cm) for the hybrid (4*1) and the lowest number was (75.24 cm) for the hybrid (1*3). The results agree with [2,4,10].

**Table 4.** The average top height kernel (cm) for species, densities, and interferences for the two seasons (spring and autumn).

| Species | Densities | The average species |
|---------|-----------|---------------------|
| 1       | 116.49    | 119.33             | 84.03 | 106.62 |
| 2       | 94.32     | 96.43              | 106.92 | 99.22 |
| 3       | 96.10     | 104.06             | 92.46 | 97.54 |
| 4       | 116.75    | 109.56             | 88.33 | 104.88 |
| 5       | 108.31    | 101.95             | 92.37 | 100.88 |
| LSD5%   |           | 5.21               |       | 3.47  |
| The average densities | 106.39 | 106.27 | 92.82 |
| LSD5%   |           | 4.48               |       |       |

| Species | Densities | The average species |
|---------|-----------|---------------------|
| 1       | 97.35     | 78.55              | 75.24 | 83.71 |
| 2       | 86.57     | 80                 | 94.45 | 87.01 |
| 3       | 83.45     | 91                 | 87.27 | 87.24 |
| 4       | 116.94    | 88.07              | 83.62 | 96.21 |
| 5       | 95.97     | 91.58              | 89.92 | 92.49 |
| LSD5%   |           | 5.21               |       | 3.01  |
| The average densities | 96.06 | 85.84 | 86.10 |
| LSD5%   |           | 2.33               |       |       |
3.3 Kernel corn length

The results pointed out in table (5) the excess of the first density for the average number of kernel corn length reached (19.87 cm) and the lowest number was (18.71 cm) for the third density. As for the species, the average number of kernel corn length in the plant for the fourth genotype (20.60 cm) and the lowest number reached (18.58 cm) for the second genotype. As for the hybrid, the highest average number of kernel corn in the plant reached (21.15 cm) for the hybrid (3*3) and the lowest number for the hybrid (5*3) reached (17.42 cm).

As for the second season (spring), it was noticed that there are significant differences for densities, species, and interference among them for the characteristic of kernel corn length in yellow maize. The results have shown in table (5) the excess of the second density and is given the highest average number of kernel corn in the plant (17.81 cm) and the lowest number reached (16.59 cm) for the third density. As for the species, the highest average number of kernel corn length in the plant reached (18.81 cm) for the fourth genotype and the lowest number for the genotype was (16.33 cm) for the second genotype. As for the hybrid, the highest average number of kernel corn length in the plant (21.68 cm) for the hybrid (4*2) and the lowest number was (17.42 cm) for the hybrid (5*3). The results agree with [1,4,10].

**Table 5.** The average kernel corn length kernel (cm) for species, densities, and interferences for the two seasons (spring and autumn).

|                  | Kernel corn length |                  |
|------------------|--------------------|------------------|
|                  | The first season    |                  |
|                  | Species             | Densities        | The average species |
|                  |                     | 1  | 2  | 3  |              |
| 1                | 19.90              | 19.11 | 17.75 | 18.92 |
| 2                | 18.48              | 19.10 | 18.15 | 18.58 |
| 3                | 18.98              | 20.43 | 21.15 | 20.19 |
| 4                | 21.03              | 21.68 | 19.08 | 20.60 |
| 5                | 20.98              | 17.72 | 17.42 | 18.71 |
| LSD5%            | 0.91               |                  | 0.67              |
| The average densities | 19.87              | 19.61 | 18.71 |          |
| LSD5%            | 0.87               |                  |                  |
|                  | The second season   |                  |
|                  | Species             | Densities        | The average species |
|                  |                     | 3  | 2  | 1  |              |
| 1                | 15.907             | 17.467 | 17.707 | 17.03 |
| 2                | 15.37              | 17.503 | 16.11  | 16.33 |
| 3                | 18.867             | 18.93  | 17.23  | 18.34 |
| 4                | 18.02              | 19.49  | 18.91  | 18.81 |
| 5                | 14.767             | 15.653 | 18.637 | 16.35 |
| LSD5%            | 0.91               |                  | 0.52              |
| The average densities | 16.59              | 17.81 | 17.72 |          |
| LSD5%            | 0.41               |                  |                  |
3.4 The number of an kernel corn

The results pointed out as in table (6) the excess of the second density for the average number of rows in the plant (33.33 rows. Kernel 1) and the lowest number was (34.07 rows. Kernel 1) for the third density. As for the species, the highest average number of rows in the plant reached (34.84 rows. Kernel 1) for the third genotype and the lowest number for the first genotype reached (32.99 rows. Kernel 1). As for the hybrid, the highest average number of rows in the hybrid plant (3*3) reached (37.63 rows. Kernel 1) and the lowest number for the hybrid genotype (2*3) was (31.79 rows. Kernel 1).

In the second season (spring), it was noticed that there are not significant differences concerning densities (the distances), but there are significant differences for species and interference between species and densities for a characteristic of the number of rows in yellow maize. The results have shown as in table (6) the excess of the first density and was given the highest average number of rows in the plant (31.76 rows. Kernel 1) and the lowest number was (32.53 rows. Kernel 1) for the third density. As for species, the highest average number of rows in the plant was (32.99 rows. Kernel 1) for the fifth genotype and the lowest number was (31.27 rows. Kernel 1) for the first genotype. As for the hybrid, the highest average number of rows in the hybrid plant (3*3) reached (34.81 rows. Kernel 1) and the lowest number (4*2) reached (30.26 rows. Kernel 1). The results agree with [2,8,10].

**Table 6.** The average number of rows in an kernel of corn for species, densities, and the interferences for the two seasons (autumn and spring).

| The average number of rows in an kernel of corn | The first season | The average species |
|-----------------------------------------------|-----------------|-------------------|
| Species | Densities | 1 | 2 | 3 | |
| 1 | 33.10 | 32.19 | 33.67 | 32.99 |
| 2 | 32.87 | 34.52 | 31.79 | 33.06 |
| 3 | 32.67 | 34.21 | 37.63 | 34.84 |
| 4 | 33.62 | 32.32 | 33.35 | 33.10 |
| 5 | 36.81 | 33.42 | 33.91 | 34.71 |
| LSD5% | 1.81 | | | 0.66 |
| The average densities | 33.81 | 33.33 | 34.07 | |
| LSD5% | NS | | | |

| The second season | The average species |
|-------------------|-------------------|
| Species | Densities | 1 | 2 | 3 | |
| 1 | 30.47 | 31.15 | 32.2 | 31.27 |
| 2 | 31 | 33.48 | 30.29 | 31.59 |
| 3 | 30.95 | 32.71 | 34.81 | 32.82 |
| 4 | 31.7 | 30.26 | 32.73 | 31.56 |
| 5 | 34.67 | 31.67 | 32.64 | 32.99 |
| LSD5% | 1.81 | | | 1.05 |
| The average densities | 31.76 | 31.85 | 32.53 | |
| LSD5% | NS | | | |
3.5 The number of kernels in a row

The results, as in table (7), pointed out the excess of the first density for the average number of kernels in a row and it reached (14.88 kernels. Row 1). The lowest number was (14.51 kernels. Row 1) for the third density. As for the species, the highest number of kernels in a row for the plant for the third genotype was (15.20 kernels. Row 1) and the lowest number reached (14.36 kernels. Row 1) for the fifth genotype. As for the hybrid, the highest average number of kernels in a row for the plant reached (15.33 kernels. Row 1) for the hybrid (1*3) and the lowest number reached (13.47 kernels. Row 1) for the hybrid (5*3).

As for the second season (spring), it was noticed that there are not also significant differences concerning densities (distances), but there are significant differences and interference among the species and densities for the characteristic of the number of kernels in a row for yellow maize. The results have shown as in table (7) the excess of the second density and was given the highest average number of kernels in a row for the plant (14.89 kernels. Row 1) and the lowest number for the third density reached (14.58 kernels. Row 1). As for the species, the highest average number of kernels in a row for the plant reached (15.29 kernels. Row 1) for the third genotype and the lowest number was (13.78 kernels. Row 1) for the first genotype. As for the hybrid, the highest number of kernels in a row for the hybrid plant (3*2) and the hybrid (5*2) reached (15.93 kernels. Row 1). The lowest number reached (12.53 kernels. Row 1) for the hybrid (1*1). The results agree with [2,9,11].

Table 7. The average number of kernels in a row for species, plant densities, and the interferences for the two seasons (spring and autumn).

| Species | Densities | The average densities |
|---------|-----------|-----------------------|
|         | 1         | 2         | 3         |
| 1       | 14.47     | 15.13     | 15.33     | 14.98     |
| 2       | 15.27     | 14.53     | 14.13     | 14.64     |
| 3       | 15.27     | 15.13     | 15.20     | 15.20     |
| 4       | 15.00     | 13.93     | 14.40     | 14.44     |
| 5       | 14.40     | 15.20     | 13.47     | 14.36     |
| LSD5%   | 0.81      |           |           | 0.18      |
| The average densities | 14.88 | 14.79 | 14.51 |
| LSD5%   | 0.24      |           |           |

The second season

| Species | Densities | The average species |
|---------|-----------|---------------------|
|         | 1         | 2         | 3         |
| 1       | 12.533    | 13.4      | 15.4      | 13.78     |
| 2       | 14.733    | 15.2      | 13.167    | 14.37     |
| 3       | 15.333    | 15.933    | 14.6      | 15.29     |
| 4       | 15.433    | 14        | 15.467    | 14.97     |
| 5       | 15.6      | 15.933    | 14.267    | 15.27     |
| LSD5%   | 0.81      |           |           | 0.46      |
| The average densities | 14.73 | 14.89 | 14.58 |
| LSD5%   | NS        |           |           |
3.6 Plant yield

The results as in table (8) have shown the excess of the first density for the average number of yield plant (183.71 gm. Plant 1) and the lowest number was (143.12 gm. Plant 1) for the third density. As for the species, the highest average number of the plant reached (171.70 gm. Plant 1) for the first genotype. The lowest number was (149.66 gm. Plant 1) for the second genotype. As for the hybrid, the highest average number of the plant reached (197.15 gm. Plant 1) for the hybrid (1*1) and the lowest number reached (121.97 gm. Plant 1) for the hybrid (5*3).

As for the second season (spring), it was noticed that there are not significant differences for the densities (distances), but there are significant differences for the species, the interference among the species, and the densities for the characteristic of plant yield for yellow maize. The results as in table (8) have shown the excess of the second density and was given the highest average number of yield plant (145.78 gm. Plant 1) and the lowest third density reached (140.38 gm. Plant 1). The species has reached the highest average number of yield plant (167.23 gm. Plant 1) for the fifth genotype and the lowest number reached (120.80 gm. Plant 1) for the first genotype. As for the hybrid, the highest number reached (186.60 gm. Plant 1) for the hybrid (5*1) and the lowest number reached (104.40 gm. Plant 1) for the hybrid (5*1). The results agree with [2,4].

Table 8. The average number of yield plant (gm) die the species, plant densities, and the interferences for the two seasons (spring and autumn).

| Species | Densities | The average species |
|---------|-----------|---------------------|
| 1       | 197.15    | 154.90 163.06 171.70 |
| 2       | 161.26    | 152.42 135.30 149.66 |
| 3       | 194.11    | 155.67 146.70 165.49 |
| 4       | 180.87    | 146.48 148.54 158.63 |
| 5       | 185.15    | 152.70 121.97 153.27 |
| LSD5%   | 21.92     | 3.45    |
| The average densities | 183.71 152.43 143.11 |
| LSD5%   | 4.45      |

The second season

| Species | Densities | The average species |
|---------|-----------|---------------------|
| 1       | 142.5     | 115.5 104.4 120.80 |
| 2       | 105.9     | 157.5 128.4 130.60 |
| 3       | 153.7     | 148.9 152.9 151.83 |
| 4       | 154.2     | 137.5 151.3 147.67 |
| 5       | 145.6     | 169.5 186.6 167.23 |
| LSD5%   | 21.92     | 12.66 |
| The average densities | 140.38 145.78 144.72 |
| LSD5%   | NS        |

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