Study of Yield and its Components for Several Genotypes of Durum Wheat (*Triticum Durum* L.) Newly Derived Under Three Seeding Rate in the Conditions of Anbar Governorate

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Abstract. A field experiment was carried out in a farmer’s field in Zakhikha which is one of the rural areas of western Heet City (about 15 kg) in Anbar Governorate, during Winter season 2020-2021, with sandy loam soil, to study seven newly derived genotypes from durum wheat, including two cultivars. They are registered, certified, and commonly cultivated in Iraq, under three seeding rate to select the ones that are suitable for the conditions of Anbar Governorate. Randomized complete blocks design (RCBD) was used in a split plot arrangement with three replications. The experiment included three Seeding rate (140, 160 and 180 kg ha\(^{-1}\)) that represented the main plot, whereas the sub plots were occupied by seven genotypes (Latifia, Babel-30, Babel-31, Babel-32, Babel-86, and the two approved varieties Dour-29 and Dour-85). The results of the study showed that Babel-32 outperformed the rest of significant effect genotypes with highest average number of spikes (507.6 spike m\(^{-2}\)) and grain yield (8.741 Mg ha\(^{-1}\)), while the genotype Babel-86 was superior in weight of 1000 grain (55.89 g), and the cultivar (Dour-29) outperformed for the trait of number of grains per spike (39.15 grains spike\(^{-1}\)). A significant effect of plant densities appeared in the studied traits, as the plants grown at seeding rate (180 kg ha\(^{-1}\)) recorded the highest average in the trait of number of spikes m\(^{-2}\) (506.2 spike m\(^{-2}\)) and grain yield (8.898 Mg ha\(^{-1}\)) And the percentage of protein (11.89%). While planting plants at seeding rates (140 kg ha\(^{-1}\)) led to the highest rate of number of grains per spike (38.42 grains) and 1000 grains weight (52.71 g). There was a significant interaction between genotypes and Seeding rate.

1. Introduction

Coarse wheat, or what is called (durum or hard) wheat, or macaroni wheat, whose English name is durum wheat, and scientific (*Triticum durum* L.), is one of the two main types of wheat in the world. It is characterized by its cruelty and its high protein content, which made it distinguished in its use and suitability for making pastries such as pasta, spaghetti, bulgur and groats...etc. Wheat cultivation spreads and outperforms other crops in universal production and cultivated area. It is the main source of energy that humans need due to its good balancing advantage between carbohydrates and proteins in its grains [1] because of the annual growth of the population, the need for wheat at the global level is constantly increasing. It occupies about 17% of the total cultivated area in the.

The cultivated area in Iraq is estimated at about 1.583 million hectares, with a total production of 4.343 million Mg ha\(^{-1}\), with an average yield of 2.744 Mg ha\(^{-1}\) [2]. Therefore, appropriate plans and programs...
must be developed in order to obtain varieties with high productivity and good and desirable genetic traits that are appropriate with their cultivation areas to achieve effective productivity and fill the shortage in the future [3].

The development of new genetic cultivars is accompanied by the adoption of modern scientific methods in the management and service of the crop, starting from the land preparation and ending with the harvesting operations, the most important of which is the adoption of appropriate Seeding rate as determining the appropriate seed quantities to give good vegetative growth in the field has a positive effect in intercepting the largest proportion of the solar radiation needed to carry out the process Photosynthesis, which is reflected on the yield of the cultivated variet. In addition to exploiting the maximum possible amount of agricultural inputs (irrigation, fertilization and other service factors) in order to achieve the highest economic return from the unit.

The first important step in deriving new genotypes is to evaluate these genotypes under important management factors, including seed rate, choose the best ones, and compare their performance in relation to the local variety. In order to be accepted by the farmer, it must exceed or not be less than the yield of the local variety. Therefore, this study aims to:
1. Determining the best of these genotypes in terms of their suitability and response to the conditions of the agricultural area and giving them the highest productivity per unit town.
2. Determining the appropriate plant density for each of these genotypes to achieve the highest productivity.

2. Materials and Methods
The field experiment was carried out in the Zakhikha town, which is one of the rural areas west of Heet city (about 15 km) in Anbar Governorate with sandy loam soil, for season 2020-2021. Randomized complete blocks design (RCBD) was used in a split plot arrangement with three replications. The experiment included three planting rates (140, 160 and 180 kg ha\(^{-1}\)) that represented the main plot, whereas the sub plots were occupied by the seven genotypes (Latifia, Babel-30, Babel-31, Babel-32, Babel-86, and two approved varieties Dour-29 and Dour-85). With the aim of evaluating seven newly derived genotypes of durum wheat, including two registered and approved cultivars commonly cultivated in Iraq, under different seeding rate, to select the appropriate ones for the conditions of Anbar Governorate. The experimental land was plowed, smoothed, and leveled, and then divided into experimental units 2x 2.5 m, each genotype was planted with ten lines in each experimental unit, the length of each line was 2.5 m, the distance between lines was 0.2 m, and a planting depth of 3-5cm. Cultivated manually on (15/11/2020)
The amount of seed per line was calculated according to the following equation. [4]

\[
Q = \frac{D \times L \times R}{10000}
\]

Where: -. 
Q = quantity of seeds per line, D = distance between lines, L = length of the line, R = seeding rate per hectare

\[
= \frac{D \times L \times R}{10000}
\]
Yield and yield components characters
At full maturity, a square meter area was harvested from the median lines for each experimental unit to study the following characteristics:

2.1. Number of spikes per m$^2$. is the number of spikes per square meter area.

2.2. The number of grains in the spike. the average number of grains for twenty-five spikes was taken randomly from each experimental unit after manually threshed these spikes, then the number of grains spike$^{-1}$ was calculated.

2.3. The weight of 1000 grains (gm). A random sample consisting of 1000 grains of clean grains free of impurities was taken from the harvested grains of spikes of the total yield of each experimental unit at a humidity of 14% and their weights were measured.

2.4. Grain yield (Mg ha$^{-1}$). It was estimated on the basis of the grain weight of the sample harvested in a square meter area at 14% humidity in each experimental unit after manual threshing of the plants, cleaning and transformed on the basis of Mg ha$^{-1}$.

2.5. Percentage of protein in cereals. The percentage of protein in cereals was estimated using the electronic device (Micro Kjeldhal) in the Central Laboratory / College of Agriculture - University of Anbar.

3. Results and Discussion

3.1. Number of Spikes m$^{-2}$.

Genotypes differ in their ability to produce spikes, and this trait is affected by several factors, including genetic factors and environmental factors that surround the plant. The number of spikes is determined by the plant’s early life stages (the tillering stage), and it is one of the most important goals for plant breeders and researchers because it is one of the main yield components of the wheat crop. [5]

It is noted from the results of Table (1) that there are significant differences between the genotypes for the number of spikes, the genotype (Babel-32) was superior by recording the highest number of spikes of 507.6 spikes m$^{-2}$, while the variety (Dour-85) recorded the lowest spike number of 439.2 spikes m$^{-2}$. This result is in line with the findings of [6]and [7·8·9], who showed the presence of significant differences between the genotypes of wheat crop in the characteristic of the number of spikes per unit area.

The averages of the same table indicate that there are significant differences between Seeding rate. The high Seeding rate. (180 kg ha$^{-1}$) outperformed by recording the highest average number of spikes, which amounted to 506.2 spikes m$^{-2}$, while the low density recorded the lowest number of spikes, which amounted to 445.6 spikes m$^{-2}$. The reason for this may be attributed to the fact that the increase in plant density led to an increase in the number of plants per unit area, and this contributes to an increase in the tillers of bearing spikes. This finding is in agreement with the findings of [10]and[11·8·12·13], which indicated that the increase in the seeding rate had led to an increase in the number of spikes per unit area.

Table (1) Effect of genotypes and plant densities on the characteristic of the number of spikes per m$^{2}$ of wheat crop

| genotypes  | Seeding rate (kg ha$^{-1}$) | Mean   |
|------------|-----------------------------|--------|
|            | 140                         | 160    | 180    |       |
| Dour-29    | 474.7                       | 471.3  | 495.0  | 480.3 |
| Dour-85    | 386.3                       | 454.3  | 477.0  | 439.2 |
| Latifia    | 460.3                       | 453.7  | 473.0  | 462.3 |
| Babel-30   | 448.7                       | 500.7  | 543.3  | 497.6 |
| Babel-31   | 445.0                       | 457.7  | 497.7  | 466.8 |
| Babel-32   | 478.3                       | 488.7  | 555.7  | 507.6 |
| Babel-86   | 425.7                       | 454.7  | 501.7  | 460.7 |
| Mean       | 445.6                       | 468.7  | 506.2  |       |

LSD $^{0.05}$ Cultivar Plant density Cultivar* Plant density
21.11 18.67 36.39
3.2. Number of Grain Per Spike

Genotypes differ in the characteristic of the grain yield of the wheat crop, and the reason may be due to the superiority of the genotypes in one of the components of the yield, including the number of grains in the spike, so this trait is considered one of the best and strongest components of the yield in relation to the amount of grain yield. The results indicated that there was a significant effect of the genotypes on the number of grains in the spike (Table 2), and that the genotypes (Dour-29) was superior by giving the highest average number of grains in the spike, which amounted to 39.15 grains, which did not differ with the genotype (Babel-32) and cultivar Latitia, which averaged 38.81 and 38.46 grains spike$^{-1}$ respectively, On the other hand, the genotype (Babel-86) recorded the lowest average for the trait, which amounted to 34.99 grains spike$^{-1}$, which did not differ significantly with the genotype (Babel-31), which had an average of 35.68 grains spike$^{-1}$. The reason for the existence of significant differences between the genotypes may be due to the difference in the efficiency of the genotypes in accumulation of dry matter and transforming it well into its reproductive growth. These results are in agreement with the findings of [14] and [7,15]. They indicated that there were significant differences between the genotypes in the trait of the number of grains in the spike.

While the same table showed a significant interaction between the two factors of the study for this trait, the highest average of grains per spike for genotype (Babel-32) with plant density (160 kg ha$^{-1}$) was achieved with an average of 41.89 grains spike$^{-1}$. While the lowest was recorded by genotype (Babel-31) with plant density (180 kg ha$^{-1}$) with an average of 35.09 grains per spike$^{-1}$.

Table (2) The effect of genotypes and plant densities on the number of grains per spike of durum wheat for the 2019/2020 season.

| Cultivars | Seeding rate (kg ha$^{-1}$) | Mean |
|-----------|-----------------------------|------|
|           | 140 | 160 | 180 |       |
| Dour-29   | 40.31 | 35.49 | 41.66 | 39.15 |
| Dour-85   | 38.52 | 36.00 | 35.67 | 36.73 |
| Latitia   | 40.80 | 36.03 | 38.55 | 38.46 |
| Babel-30  | 39.00 | 37.63 | 35.98 | 37.54 |
| Babel-31  | 36.16 | 35.78 | 35.09 | 35.68 |
| Babel-32  | 38.47 | 41.89 | 36.07 | 38.81 |
| Babel-86  | 35.68 | 32.69 | 36.60 | 34.99 |
| Mean      | 38.42 | 36.50 | 37.09 |       |

LSD 0.05 Cultivar 1.570 Plant density NS Cultivar* Plant density 2.942

3.3. Weight of 1000 Grains (gm)

The weight of 1000 grains is one of the main components of the yield, which indicates the specific weight of the grains. It represents the mass of the grain measured in grams, and this characteristic is a good determinant of grain size and density, as well as the amount of extraction expected from wheat flour.

The results indicated that there are significant differences between the genotypes of this trait (Table 3), and that the genotype (Babel-86) was superior by giving the highest average weight of 1000 grains (55.89 g), followed by the variety Dour-85 which recorded an average of 54.56 g. The variety (Dour-29) is the lowest average for this trait (48.67 g). The reason for the superiority of some genotypes in this trait may be attributed to having different genetic and physiological components from the rest of the genotypes and thus its high efficiency in redistribution of the products of photosynthesis from the vegetative parts of the plant to the reproductive parts, especially the growing grains, which was reflected in an increase in their weight. These results were in line with previous studies, including [16] and [17,18,19],
The results also indicate that there are significant differences between plant densities for this trait. The low plant density (140 kg ha\(^{-1}\)) recorded an average of 52.71 g. While the plant density (160 kg ha\(^{-1}\)) recorded the lowest average of 50.67 g. The reason for the decrease in this trait in general at the high rate of seeding, is that the increase in plant density per unit area leads to an increase in competition among the crop plants for growth requirements and thus lower efficiency of the process of photosynthesis and dry manufactured materials that are transferred to the sinks (grains), and these manufactured materials will be distributed over a greater number of spikes resulting from the high rate of seeding (Table, 1), and the weight of the grains will decrease accordingly. This finding was consistent with what was found by [20]and[21].Which proved that the average grain weight decreases with the increase in the seeding rate.

Also, there was a significant interaction between the two factors of the study for this trait. The highest average of the genotype (Babel-86) with plant density (140 kg ha\(^{-1}\)) was achieved 57.33 g. While the lowest average of the genotype Babel-30 with the plant density (160 kg ha\(^{-1}\)) with an average of 43.33 g.

Table (3) The effect of genotypes and plant densities on the weight of 1000 grain (g) of durum wheat for the 2019/2020 season.

| Cultivars  | Seeding rate (kg ha\(^{-1}\)) | Mean       |
|------------|-------------------------------|------------|
|            | 140                           | 160        | 180        |
| Dour-29    | 47.67                         | 49.33      | 49.00      | 48.67 |
| Dour-85    | 55.00                         | 53.00      | 55.67      | 54.56 |
| Latifia    | 52.33                         | 52.00      | 53.00      | 52.44 |
| Babel-30   | 49.00                         | 43.33      | 50.33      | 47.56 |
| Babel-31   | 55.00                         | 53.67      | 53.00      | 53.89 |
| Babel-32   | 52.67                         | 48.33      | 48.67      | 49.89 |
| Babel-86   | 57.33                         | 55.00      | 55.33      | 55.89 |
| Mean       | 52.71                         | 50.67      | 52.14      |       |

LSD \(_{0.05}\) Cultivar 1.359 Plant density 1.717 Cultivar\(^*\) Plant density 2.532

3.4. Grain yield (Mg ha\(^{-1}\))

This characteristic reflects the final outcome of the biological processes that occur inside the plant, so it is considered the most important field measure. The occurrence of the grain yield under the influence of the genetic structure makes it interact with the growth factors surrounding the plant, which include water, air, light, minerals, soil and crop managements that greatly affect the growth of the plant and yield.

The results indicate that there are significant differences between the genotypes (Table 4), and that the genotype Babel-32 was superior by giving it the highest average (8.741 Mg h\(^{-1}\)), followed by the genotype Babel-86, which recorded an average of 8.194 Mg.h\(^{-1}\), while the cultivar Dour-85 recorded the lowest (7.750 Mg h\(^{-1}\)). The genotype (Babel-32) achieved an increase in yield over the lowest average by 13%. The reason for the superiority of the genotype Babel-32 in this trait may be due to its superiority in the number of spikes per square meter (Table, 1) and the number of grains in the spike (Table 2), and that these traits are directly related to the grain yield. These results were in agreement with previous studies, including [22]and[19]; [23] who indicated that there is a significant effect of the genotypes on the trait of grain yield.

The results also indicated the positive effect of increasing the plant density on grain yield, the seeding rate (180 kg ha\(^{-1}\)) outperformed and the highest average was recorded 8.898 Mg ha\(^{-1}\), while the low density (140 kg ha\(^{-1}\)) recorded the lowest average (7.343 Mg ha\(^{-1}\)). The reason for the increase in the yield with the increase in the seeding rate may be due to the increase in plant density led to an increase in the number of spikes per unit area (Table.1), which was positively reflected in the increase in the grain yield. These
results agreed with what was obtained by [24] and [25-10-12-19]. Who indicated that there was a significant effect of increasing plant density on the trait of grain yield for wheat crop.

Table (4) The effect of genotypes and plant densities on the character of the grain yield (Mg ha⁻¹) of the wheat crop for the 2019/2020 season

| Cultivars | Seeding rate (kg ha⁻¹) | Mean |
|-----------|------------------------|------|
|           | 140                    | 160  | 180  |
| Dour-29   | 7.417                  | 7.817| 9.250| 8.161|
| Dour-85   | 6.517                  | 8.083| 8.650| 7.750|
| Latifa    | 7.933                  | 7.750| 8.680| 8.121|
| Babel-30  | 7.050                  | 7.867| 8.913| 7.943|
| Babel-31  | 7.183                  | 7.950| 8.333| 7.822|
| Babel-32  | 7.950                  | 9.217| 9.057| 8.741|
| Babel-86  | 7.350                  | 7.833| 9.400| 8.194|
| Mean      | 7.343                  | 8.074| 8.898|      |

LSD ₀.₀₅ Cultivar 0.573 Plant density 0.888 Cultivar* Plant density NS  

3.5. Percentage of protein in cereals %

Many studies have shown that the percentage of total protein in coarse wheat ranges from 6% to 20% depending on the variety, rank and environmental conditions, as well as on agricultural operations during the growing season. Heat and drought, when they rise during the ripening period of the bean, leads to a high percentage of protein [26]. It is noted from the results of (Table 5) that there are significant differences between the genotypes of this trait, where the genotype (Babylon-32) recorded the highest average of 12.18%, while the genotype (Babylon-30) recorded the lowest average of 9.82%, and the reason for the difference between the structures is attributed. These results are in agreement with the findings of [27] and [22,28,29], who indicated that there were significant differences for the genotypes in the percentage of protein characteristic in cereals.

Results of the same (Table 5) indicated that there were significant differences between the plant densities used in the experiment for the percentage of protein in cereals, where the high density (180 kg ha⁻¹) recorded the highest average of 11.89%, while the density gave (140 kg ha⁻¹) the lowest average was 9.88%. these results are in agreement with [29] and [8-12-13], who reported that there were significant differences between the different seeding rates of wheat crop in the percentage of protein in the grains. Also, the results of the same table indicate that there are significant differences for the interaction between the factors of genotypes and plant densities, where the genotype (Babylon-32) outperformed the plant density (180 kg ha⁻¹) by recording the highest average for this trait and reached 14.75%. While the genotype (Babylon-31) with plant density (160 kg ha⁻¹) recorded the lowest average of 8.20%.

Table (5) The effect of genotypes and plant densities on the character of the Percentage of protein in cereals % of the wheat crop for the 2020/2021 season

| Cultivars | Seeding rate (kg ha⁻¹) | Mean |
|-----------|------------------------|------|
|           | 140                    | 160  | 180  |
| Dour-29   | 8.90                   | 13.80| 10.65| 11.12|
| Dour-85   | 10.60                  | 13.50| 10.03| 11.37|

Table 5: Effect of genotypes and plant densities on the character of Percentage of protein in cereals % of the wheat crop for the 2020/2021 season.
4. Conclusions:
The genotypes differed in their response to the conditions of the experiment area, through the difference in the characteristics of the crop and its components. This confirms the existence of differences in its genetic nature, as the genotype (Babylon-32) outweighed the genotype (Babylon-86) in most growth and yield traits. It shows that the density (180 kg.ha⁻¹) was superior in most of the yield characteristics and its components. The binary interaction between the two factors of the study shows a significant effect in most of the studied traits, and the best of these interactions was between all structures with a high seeding rate (180 kg.ha⁻¹).

References

[1] AL-Daoudi, S., A., M., and D., S., M., Al-Obaidi. 2014. Estimation of some genetic parameters and pathway coefficient analysis for quantitative and qualitative traits in genotypes of bread wheat (Triticum aestivum L.), Tikrit University Journal of Agricultural Sciences, 14(1):246-261.

[2] The Ministry of Planning. central Statistical Organization. Agricultural Statistics Directorate 2020 Wheat and barley production report. Iraq.

[3] Al-Obaidi, M., A., G., 2013. Deriving Varieties of Bread Wheat by Hybridization and Mutations, Iraqi Journal of Agricultural Sciences.44(4):455-463.

[4] Singh, I. D. and N.C. Stoskopof .1971. Harvest index in cereals. Agron. J.63:222-226.

[5] Jadoua, Khudair Abbas and Haider Abdel-Razzaq Baqer. 2012. Effect of seed depth on yield characteristics and components for six cultivars of wheat. Iraqi Journal of Agricultural Sciences.43(1): 25-37.

[6] Al-Maamori, S., K., A,. 2017. Effect of silicon on the growth and yield of some genotypes of wheat Triticum aestivum L. when planted in salinized soils. Master Thesis. Field Crops Division. College of Agriculture - Al-Qasim Green University. AS: 103.

[7] Al-Zubaidi, K., M., D., Nizar S., A.,Al, and I, K., K., Al-Qaisi. 2015 . Genetic analysis of grain yield and some of its components in bread wheat under different environmental conditions. Tikrit University Journal of Agricultural Sciences. 15(4): 42-54.

[8] Al-Najjar, S., M., B., 2020. Response of several genotypes introduced from bread wheat Triticum aestivum L. to different cultivation distances. Master Thesis. Department of Field Crops - College of Agriculture and Forestry - University of Mosul.

[9] Cheyed, S., H., A, J., Al-Fahd and, A., S., M., Al-Rawi. 2020. Storage traits of spikes and grain varieties of bread wheat. Iraqi Journal of Agricultural Sciences 51 (1): 252-258.

[10] El-Hawary, M.A.; G. H Abd El-Hay; M. A. Attia; and M. A. Zaire (2019) . Effect of seeding, Belcocel and nitrogen fertilizer rates on yield and yield components of wheat under North Sinai conditions. Al-Azhar J. of Agric. Res., 44(1):88-99.

[11] Dongqing, Y. ; TieCai ; I.Yong and W.Zhenlin .2019. Optimizing plant density and nitrogen application to manipulate tiller growth and increase grain yield and nitrogen-use efficiency in winter wheat. Peer j. 7. 6484.
[12] Al-Mashhadani, A.M., A. 2020. Effect of tillage systems, seed quantities and herbicides on growth and yield of bread wheat under dehydrating conditions (Triticum aestivum L.). Master's thesis. College of Agriculture and Forestry, University of Mosul.

[13] Al-Hamdani, N, J, M,. 2020. Effect of planting distances with and without pressure wheel and seeding rates on growth and yield components of bread wheat (Triticum aestivum L.). Master Thesis, College of Agriculture and Forestry, University of Mosul.

[14] Bektash, F, Y, and L, H, S,. 2015. Selection of pure lines of bread wheat for some field characteristics under different seed quantities. Iraqi Journal of Agricultural Sciences.46 (6): 902-908.

[15] Al-Fahdawi, Abdel-Qader B, S,. 2017. Effect of Glutamic, Humic and Urea Fertilizer on Growth, Yield and Quality of Several Varieties of bread Wheat. Master Thesis, Department of Field Crops, College of Agriculture, University of Anbar, Iraq.

[16] Hussain, M. A., M. S. Dohuki  and H. A. Ameen. 2017. Response of Some Bread Wheat (Triticum aestivum L.) Cultivars to Nitrogen Levels. Kufa J. For Agric. Sci. 9 (4): 365 – 390.

[17] Abdul Karim, B, H, A,. 2017. A morphological and characteristic study of cultivars of bread wheat Triticum aestivum L in the conditions of the northern region of Iraq. Master Thesis. Field Crops Division. College of Agriculture - University of Kirkuk. AS: 87.

[18] Al-Aseel, A, S, M,i, D, S, M, Al-Obaidi and M, M, Al-Qadi. 2018. Response of varieties of bread wheat. Triticum aestivum L for four planting dates. Tikrit University Journal of Agricultural Sciences 18(2):41-53.

[19] Al-Hamdani, I, I, H, K, K, A, Al-Jubouri. 2020. Effect of spraying with different concentrations of ascorbic acid lion on growth characteristics and yield of several genotypes of bread wheat. Al Furat Journal for Agricultural Sciences - 12 (2): 281 - 300.

[20] Jemal , A, ; T. Tana  and  E.Firdissa .2015.  Response of  Bread Wheat (Triticum aestivum L.) Varieties to Seeding Rates at Kulumsa, South Eastern Ethiopia- Asian. J. of Plant Scie., 14 (2): 50-58.

[21] Akhtera, M. M; A. EL Sabaggb; N. Alama; K. Hasand; E. Hafezb; C. Barutçularc; and M. S. Island .2017. Determination of seed rate of wheat (Triticum aestivum L.) varieties with varying seed size. Scientific J. of Crop Sci , 6 (3): 161-167.

[22] Rikani, O, A,r O,, M, S, Salih D, and M, A, H,. 2017. Effect of Phosphate Fertilizer on Growth and Yield of Five Cultivars of Bread Wheat. Iraqi Journal of Agricultural Sciences. 48 (6): 1796-1804.

[23] Al-Dhahi, W, T, Abd and M, S, Al-Taweel. 2021. Effect of sowing dates and seeding rates on new inputs of coarse wheat under water conditions. Al Furat Journal of Agriculture 13 (3): 33-34.

[24] Sajjad,A.; Sh. Muhammad; Inamullah ; R.U .Hafez; K .Zaid ; K.A .Muhammad ; Z .Laq ; and Usman .2018. Yield and yield components of Wheat as influenced by various tillage operations and seed rates . Ijaer, 4(1): 428 – 434.

[25] Al-Hilfy, Intsar. H; S.A. Wahid; H.M.K. Al-Abod; S. A. A. Al-Salmani; M. R. Mahmud and M. B. Hossain .2019. Grain yield and quality of wheat as affected by cultivars and seeding rates. Malaysian Journal of Sustainable Agriculture (MJA), Zibeline International Publishing, 3 (1): 8-12.

[26] California Wheatn Commission . 2001. Description of durum semolina quality factors . P. O.Box 2267, woodland CA 95776-2267 (530) 661-1292 fax: (530) 661-1332. Email: info@California wheat.org.

[27] Saudi, A, H, M, F, H, Al-Hassan and J, W, M. 2016 . Effect of planting with different seeding rates on the qualitative characteristics and viability of the seeds of four cultivars of bread wheat (Triticum aestivum L.). Iraqi Journal of Agricultural Sciences. 47(2):452-460.

[28] Falih, M, Ibrahim.2017. Response of two cultivars of bread wheat to mineral, organic and biological fertilization. PhD thesis - Department of Field Crops - College of Agriculture - University of Baghdad.
[29] Al-Jawani, O, H, S. 2020. Study of the chemical and physical properties of some varieties of Iraqi wheat compared to two types of importers in the characteristics of the flour produced. Master Thesis - Department of Food Sciences - College of Agriculture - Tikrit University.