Effect of DAP Fertilizer on Yield and Components of Soft Wheat Cultivars

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Abstract

Four cultivars of soft wheat (Abu Ghraib, IPA 99, Sham 6 and Al Ezz) were planted in sandy loam soil in one of the countryside of Ramadi in the two agricultural seasons 2012-2013 and 2013 -2014. The aim of the study was to know the growth and production of these cultivars under the influence of levels of DAP fertilizer (0, 100, 200 and 300) kg.h⁻¹. The cultivars (main plot) and levels of fertilizer (Sub-plots). These factors (4×4) were input with design in RCBD at three replicates. The seeds were sown at a rate of 120 kg.h⁻¹ on the first half of December. The results showed that IPA 99 had the highest mean spike length by 12.8 and 12.4 cm and while the highest number of grains were 90.0 and 83.7 for each spike, which resulted in high grain yield 6.9 and 4.2 t.h⁻¹ which was non significantly different from the product of Abu Ghraib and Sham 6, which gave high rates of grain in both seasons. Sham 6 has the highest number of spike per square meter 484.8 and 469.3 spikes in both seasons. The addition of DAP fertilizer didn't affect the length of spike, number of grains per spike and the weight of 1000 grains, while the effect of adding it significantly in the number of spikes per square meter and the grain yield. Adding the level of fertilizer 200 and 300 kg.h⁻¹ gave the highest rate of the number of spikes that reached (432.6, 436.7) in the first season and (437.5, 438.0) spike in the second season, as well as the highest equivalent of the grain yield of 6.7 and 4.1 t.h⁻¹ respectively. In conclusion cultivars varied in their productivity and showed an obvious response to the addition of DAP fertilizer, especially the addition of 200 kg.h⁻¹, which is capable of processing the necessary nitrogen and phosphorus for the growth and production of wheat.

Key words: Soft wheat, Grain yield, DAP, Spike length

Introduction

The DAP fertilizer is one of the most significant chemical fertilizers that wheat plant needs in its growth and production. It is a basic source for the processing of nitrogen and phosphorus elements in the plant. Al-Fahdawi and Almehemdi, (2017) that found nitrogen and phosphorus are essential for the growth and production of wheat, especially in the form of fertilizer to ensure their readiness and minimize loss and stabilization in order to make optimum use of this fertilizer. Recently, Mohammad, (2009) have shown that fertilization of 60 kg.h⁻¹of manure (27: 27: 0) N and P for a number of wheat bread cultivars under demograhic conditions has led to moral superiority in the number of spikes per square meter and grain yield compared to non-fertilization.

Several studies have revealed that phosphorus is one of the most significant nutrients in crop production, so it must be added in sufficient quantities to sustain production. However,
interestingly, that the addition of phosphorus by 80 kg.h⁻¹ results higher gave a comparison with other sources (TSP) and (NP) as well as (DAP), especially in soils lacking phosphorus. Furthermore, Al-Hamdani (0222) showed that the increase in grain production was consistent with the increase in the added levels of DAP from 80 to 160 kg.h⁻¹, with an increased rate of 32% and 44%, respectively, compared with the non-addition of phosphorus, due to the role of phosphorus in the life of the plant and thus increase the yield.

Recent evidence suggests that the increase in phosphorus levels from 0 to 100 kg.h⁻¹ resulted in a significant increase in the weight of the spikes with different types of phosphate fertilizer (Hamada et al., 2013). While that fertilizer DAP and fertilizer (TSP) gave the highest yield of dry matter, as the addition of phosphate fertilizer by the level of 120 kg.h⁻¹ the highest dry matter content (Noor et al., 2017). DAP fertilized is significantly on fertilizer (TSP) in the highest yield of dry matter, as the addition of phosphate fertilizer at the level of 120 kg.h⁻¹ highest dry matter yield (AL-Fahdawi, 2012). This means that the difference of the type of fertilizer is due to the difference in the type of soil planted with wheat plant as well as the different climatic conditions that result in different conditions in the decomposition of fertilizer and response by the plant. Ron and Loewy confirmed that the response to DAP and TSP was related to phosphorus-ready and soil tissue, where the DAP fertilizer was added by 80 kg.h⁻¹ to give the highest rate of wheat production in coarse soil compared to medium soil Tissue. The importance of DAP fertilizer in wheat production showed that the fertilizer increased the grain yield by 29% compared to the non-coated DAP fertilizer (AL-Fahdawi, 2010). The importance of DAP fertilizer has been demonstrated in wheat production. A study has been conducted to test the importance of adding different levels of wheat to the cultivation of a number of cultivars of bread wheat in agricultural soils producing this crop.

Materials and Methods

Four cultivars of soft wheat (Abu Ghraib, IPA 99, Sham 6 and Al Ezz) were planted in the 2012-2013 and 2013-2014 seasons in the first half of December, in sandy loam soil in one of the villages of Al-Ramadi city with electrical connection 2.14 dS / m⁻¹ and pH 7.6 and NO₃ 221 mg / L and phosphorus ready 4.3 ppm. The main objective of the experiment is to know the growth and production of these cultivars under the influence of adding levels of DAP (N - P₂O₅ - K) (0 - 46 - 18) % Jordanian origin at rates of 0, 100, 200, 300 kg.h⁻¹ fertilizer.

The experimental land was plowed twice with the taper plow. The smoothing process was done using the spring compass machine and the field was divided into experimental units of 3 m² with a distance of 2 x 1.5 m. The cultivars were input (main plot), levels of fertilizer (sup plot), and splitting of splits in the design of Random Complete Block Design (RCBD) at three replicates were developed. DAP fertilizer was added at one time during the dispersion of the grains within the experimental plates and with a quantity of 120 kg.h⁻¹ (Mohammed, 2000). The nitrogen requirement was supplemented by 50 kg.h⁻¹ of urea fertilizer in light of its proportion in DAP fertilizer and was added in the first two steps after the germination and the second before the phase of the expulsion of the spikes. The water of the Euphrates River was used in the irrigation process, with irrigation amounting to 6-7 numbers of watering times during the planting season. A total area of one square meter of each experimental unit was harvested after total maturity to estimate the number of spikes per square meter and grain yield. Ten spikes were selected to measure the length of the spike and the number of grains in the spike was
estimated at 1000 grains. The results were statistically analyzed by the general variance analysis method and the least significant difference (LSD) was used to compare the averages of the studied measures (Dawood, 1990).

Results and Discussion
Effect of DAP fertilizer in its components and components

1. Number of spikes per square meter.

This is one of the most important components of grain in wheat. The results shown in Table 1 indicate that the cultivars differed significantly in the number of spikes produced per square meter, above the Shame 6 cultivar with the highest recipe rate of 484.8 and 469.3 spike/m² compared with the other cultivars, that AL Ezz cultivar gave lowest rate per square meter was 379.2 and 351.2 for the seasons of agriculture, respectively. There were no significant differences between Abu Ghraib and IPA 99 in the rate of this characteristic, but they were given convergent rates during the two seasons of agriculture It is normal that the cultivars differ in the production of the spikes due to the nature of the genetic cultivar as well as the difference in the composition of the tillers. Al-Fahdawi, (2012) found that Shame 6 was superior to the production of tillers per plant compared to seven genotypes It were planted in two seasons and surpassed its aggregate rate in traditional prose cultivation In addition, Al-Fahdawi and Muslih (2014) also confirmed the superiority of Shame 6 in the formation of the highest rate of the number of tillers producing fertile spikes compared to nine other genotypes of soft wheat cultivated in an unconventional manner (Planting boxes) that give real evidence for the number of tillers spikes produces fertile which confirms the genetic nature of the cultivar in excellence in this characteristic compared to other cultivars.

It is clear from the same table that fertilization with different levels of fertilizer DAP has significantly increased the number of spikes per square meter in the two seasons of the agriculture with an additional level of 200 and 300 kg.h⁻¹, which is not significant for the addition of manure, with rates of 432.6 and 436.7 In the first planting season, while in the second planting season, the rates were 437.5 and 438.0 spikes per square meter, respectively, compared with the non-addition of the fertilizer DAP, which gave the lowest rate of 393.4 and 378.7 spike / m² in the two planting seasons respectively.

There is a growing response to the added DAP fertilizer in the composition of the spikes with increasing levels of addition, and the reason for this increase is due to the improvement of some of the characteristics of the component, especially the number of spikes per square meter as well as the number of grains in the spike. For the same reason, Al-Fahdawi and Almehemdi (2017) found that the addition of fertilizer DAP by 200 kg.h⁻¹ led to the production of 350.4 spikes per square meter compared with no addition of fertilizer, which produced 229.6 spike. Table 1 also shows significant interaction between cultivars and DAP fertilizer in the first planting season with the superiority of cultivar Shame 6 with the highest number of spikes per square meter, with 525.3 spikes at fertilization rate of 100 kg.h⁻¹. Compared with AL Ezz cultivar which was gave the lowest rate 310.0 spike at the same level. It should be noted here that the reason for this is that the levels of additive did not differ significantly between them, while the superiority of cultivar Shame 6 in this characteristic, so the effect of the variety was stronger than the effect of the additive to fertilizer, and therefore the interaction was significant and exceeded this treatment in the number of spikes per square meter.
Table 1. Effect of cultivars and fertilizer DAP in the number of spikes / m²

| Cultivars A | Compound fertilizers kg.h⁻¹ B | 2102 – 2102 | 2102 – 2102 | Average | 2102 – 2102 | 2102 – 2102 | Average |
|------------|-------------------------------|-------------|-------------|---------|-------------|-------------|---------|
|            |                               | 1 | 011 | 211 | 211 | 1 | 011 | 211 | 211 |          | 1 | 011 | 211 | 211 |          |
| Abu Ghraib |                               | 2.1.3 | 2.1.3 | 223.3 | 227.2 | 212.7 | 2.1.1 | 2.2.3 | 23..3 | 277.1 | 221.1 |
| IPA 99     |                               | 2.3.3 | 220.2 | 22..3 | 211.3 | 212.2 | 270.3 | 210.3 | 209.1 | 222.2 | 21..9 |
| Sham 6     |                               | 27..2 | .2..2 | 22..2 | 12.3 | 2.2.. | 2.9.2 | 2.3.2 | 290.2 | 271.2 | 239.2 |
| Al Ezz     |                               | 230.2 | 201.1 | 221.1 | 20..2 | 279.2 | 222.1 | 22..2 | 270.1 | 230.2 | 2.0.2 |
| LSD        |                               | 32.2 |          |      |      |      |      |      |      |      |      |
| Average    |                               | 292.2 | 219.2 | 222.3 | 223.7 | 27..7 | 29..2 | 227.. | 22..1 |      |      |
| LSD A & B  |                               | 20.7 |          |      |      |      |      |      |      |      |      |

Table 2. Effect of cultivars and fertilizer DAP in Length of the spike / sm

| Cultivars A | Compound fertilizers kg.h⁻¹ B | 2102 – 2102 | 2102 – 2102 | Average | 2102 – 2102 | 2102 – 2102 | Average |
|------------|-------------------------------|-------------|-------------|---------|-------------|-------------|---------|
|            |                               | 1 | 011 | 211 | 211 | 1 | 011 | 211 | 211 |          | 1 | 011 | 211 | 211 |          |
| Abu Ghraib |                               | 10.5 | 01.. | 01.2 | 01.2 | 01.. | 01.2 | 01.3 | 01.3 | 01.. | 01.3 |
| IPA 99     |                               | 02.7 | 02.1 | 02.7 | 02.9 | 02.. | 02.0 | 02.2 | 02.2 | 02.. | 02.2 |
| Sham 6     |                               | 01.. | 00.2 | 01.9 | 00.2 | 00.1 | 01.9 | 00.0 | 01.7 | 01.3 | 01.. |
| Al Ezz     |                               | 01.3 | 01.2 | 01.3 | 01.3 | 01.. | 01.0 | 01.1 | 01.2 | 01.7 | 01.2 |
| LSD        |                               | N.S |          |      |      |      |      |      |      |      |      |
| Average    |                               | 00.0 | 00.2 | 00.2 | 00.2 | 01.9 | 00.1 | 01.. | 00.2 |      |      |
| LSD A & B  |                               | N.S |          |      |      |      |      |      |      |      |      |

2. Length of the spike
The results shown in Table (2) indicate that the cultivars differed significantly in the mean length of the spike. The IPA 99 was superior to the highest rate of 12.8 and 12.4 cm compared with Al Ezz, which gave the lowest rate of 10.5 and 10.3 cm in the two seasons of agriculture respectively. This is due to the nature of the genotype. The superiority of cultivar IPA 99 is consistent with the results of Al-Fahdawi (2012), which found that cultivar IPA 99 gave a high rate of spike length when planted with seven other genotypes in two locations. It is clear from the same table that the addition of DAP fertilizer did not significantly affect the rate of spike length and its interaction with the cultivars.

3. The number of grains in the spike
It is clear from the results in Table (3) that the difference in the rate of this characteristic was significantly higher than IPA 99 in giving the highest number of grains in the spike of 90.0 and 83.7 grains superior to all other cultivars in which the lowest rate 51.8 and 42.7 grains in spike for the seasons of agriculture, respectively. Abu Ghraib and Sham 6 did not differ
significantly in the average number of grains in spike during the two seasons. The superiority of IPA 99 in the average number of grains in the spike is agree with the results of Wahid (16), which found that IPA 99 was superior to giving the highest aggregated rate of 65.71 grains when planted with seven other genotypes in two locations (AL-Fahdawi, 2012). This confirms that the difference in the cultivars among them in the rate of the number of grains in the spike is normal because it is related to the nature of the genus. It is noted from the same table that the addition of levels of fertilizer DAP did not significantly affect the rate of the number of grains in the spike and its interaction with the cultivars of the seasons of agriculture.

Table 3. Effect of cultivars and fertilizer DAP in the number of grains in the spike

| Cultivars A | Compound fertilizers kg.h-1 B | Average | 2102 – 2102 | Average | 2102 – 2102 |
|------------|-------------------------------|---------|-------------|---------|-------------|
|            |                               |         | 1  011  211 211 |         | 1  011  211 211 |
| Abu Ghraib | 33.3                          | 77.9    | 3..  211 211 | 70.2    | 30.3  37.1 37.2 72.7 | 37.0 |
| IPA 99     | .2.9                          | 92.9    | 92..  72.0 | 91.1    | .1.2  2.3 7.7 .2.2 | .2.7 |
| Sham 6     | 39.7                          | 72.9    | 72.3 7... | 72.9    | 71.1 73.2 33.2 7.. | 70.9 |
| Al Ezz     | .3..                          | 29.7    | .2.2  23.2 | .0..    | 22.2 21.2 22.7 22.7 | 22.7 |
| LSD        | N.S                           | N.S     |         |         | N.S          | N.S |
| Average    | 39.2                          | 72..    | 72..  70.2 | 32..    | 33.3 33.2 39.2 | 3.2 |
| LSD A & B  | N.S                           |         |         |         | 3.2          | N.S |

4. Weight of 1000 grains

This indicates the degree to which grain based on downstream power (grain) is the recipient of representative products and the strength and readiness of the source over the distribution of representative products.

The results shown in Table (4) showed that the Al Ezz cultivar was significantly higher than the weight of 1000 grains 50.3 and 32.3 g compared to IPA 99 cultivar, which gave the lowest rate of 34.5 and 25.8 respectively. These results correlate with Al-Fahdawi's (8) finding that the Al Ezz cultivar was superior to the weight of 1000 grains at a collective rate of 48.57 g, compared with the IPA99 cultivar, which gave the lowest aggregate rate of 29.64 g when planted with a number of the cultivars of soft wheat in two locations. It should be noted here that the Al Ezz cultivar, which showed the highest rate of weight of 1000 grains was low in giving the lowest rate of the number of grains in the spike during the seasons of agriculture (Table 3) and vice versa for the cultivar IPA 99, which gave the lowest rate of weight 1000 grains was superior to the highest rate of grain in Spike. Therefore, it can be said that the genotype that produces more grains in the spike produces a low grain weight. These results agree with Al-Fahdawi, (2010), which concluded that the source products are insufficient for the purpose of their transition to estuaries. The following representation of each source on genetics and environment. The same table shows that the addition of DAP fertilizer did not significantly affect the weight of 1000 grains, as well as the interaction with the cultivars in both seasons.

Table 4 Effect of cultivars and fertilizer DAP in the weight of 1000 grains (g)

| Cultivars A | Compound fertilizers kg.h-1 B | Average | 2102 – 2102 | Average | 2102 – 2102 |
|------------|-------------------------------|---------|-------------|---------|-------------|
|            |                               |         | 1  011  211 211 |         | 1  011  211 211 |
| Abu Ghraib | 22.9                          | 22.2    | 22.7 22... | 22.2    | 20.1 22.2 22.. 22.. | 22.0 |
5. Grain yield tan.h⁻¹.

The result of traits associated with hereditary factors that govern nature and environmental factors. The difference in the grain yield (Table 5) was significantly higher, with Abu Ghraib and IPA 99 superior by giving the highest mean yield of 6.9 tan.h⁻¹. Compared to sham 6 and AL Ezz cultivars which gave the lowest rate of 6.3 and 5.5 tan.h⁻¹ respectively in the first planting season. In the second planting season, it is clear from the same table, the superiority of the varieties Abu Ghraib and IPA 99 and Sham 6, which did not differ morally between the rates of this status of 4.4, 4.2 and 4.2 tan.h⁻¹ respectively, compared to the cultivar of AL Ezz, which gave the lowest rate of grain 3.1 tan.h⁻¹ in the second planting season.

The difference between the varieties of each other is due to their superiority in the number of spikes per square meter time and the length of the spike and the number of grains produced again (Tables 1, 2 and 3). This is corresponding with cultivar IPA99. The reason for this is that IPA 99, which was superior to the grain yield, was superior to the number of grains in the spike (Table 3), whereas it was low in the weight of 1000 grains during the two seasons (Table 4). Therefore, it is possible to say that the weight of 1000 grains did not have a positive effect on the increase of the yield, indicating that the AL Ezz cultivar, which was superior to the other cultivars in the weight of this attribute, gave a lower yield. This is consistent with the reference of Mohammed (2000) to find correlation positive between grain yield and number of grains in spike and negative with weight of 1000 grains. Which clearly indicates that the number of spikes and the length of the spike and the number of grains in the spike, which was the cause of the increase grain yield, it is a positive correlation with the yield so we consider the most important components of grain yield.

The results in Table 5 show that the addition of DAP fertilizer has a significant effect on increase in grain yield in both seasons. The level of fertilizer was 200 and 300 Kg.h⁻¹, which is significantly higher than the average fertilizer level of 6.7 tan.h⁻¹, compared with fertilizers level 100 and 0 kg.h⁻¹ which gave the lowest rate of 6.3 and 6.0 tan.h⁻¹ respectively in the first planting season. While all levels of addition of DAP in the second planting season were higher by giving the rates of grain yield of 4.0, 4.1 and 4.1 tan.h⁻¹, respectively, compared to non-addition of fertilizer, which gave the lowest rate of 3.6 tan.h⁻¹ and the interaction of fertilizer with the cultivars significantly increased the grain yield. It was found that the Abu Ghraib has exceeded the highest rate of grain yield of 7.4 and 5.0 tan.h⁻¹ at the level of fertilizers DAP 200 and 300kg.h⁻¹ in the seasons of agriculture, respectively.

| Cultivars A | Compound fertilizers kg.h⁻¹ B | Average | 2102 – 2102 |
|------------|-----------------------------|---------|--------------|
| IPA 99     | 22.3 22.7 22.. 22.. 23.. 22.9 22.3 23.9 2... | N.S     |              |
| Sham 6     | 2.2 29.. 21.2 20.2 29.. 29.7 21.1 21.. 22.2 21.3 | N.S     |              |
| AL Ezz     | .2.0 .0.1 29.9 2.. 2.2 .1.2 20.3 22.1 22.3 22.. 22.2 | N.S     |              |
| LSD A & B  | N.S 2.0 N.S              | 3.1     |              |

Table 5 Effect of cultivars and fertilizer DAP in grains yield tan.h⁻¹.
Found that there is a response to the addition of DAP fertilizer increase the grain yield compared to non-addition. The reason for the increase is due to the improvement of some of the characteristics of the components, especially the number of spikes per square meter as well as the number of grains in the spike, because the fertilizer DAP equips nitrogen and phosphorus in the soil, which leads to absorption by the plant and then increase growth and division of plant cells and increase the accumulation of dry matter. Al-Hamdani, (2000) pointed out that the reason for the response to DAP fertilizer is the processing of phosphorus and nitrogen in sufficient quantities and balanced with the needs of the plant for a longer period. In other words, phosphorus has been converted to the pre-cooked version of the DAP fertilizer, which is better used by plants than in other phosphate fertilizers.

We conclude from the results of grain yield and some other traits that were the cause of the increase. Any addition of DAP fertilizer showed a response in the improvement of traits and that the addition of high levels gave equal results in grain yield and during the planting seasons. This is why we recommend adding 200 kg.h⁻¹ as a fertilizer level to give the best results for wheat plant.

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