Effect of Different Combinations of NPK Fertilizer and Seed Quantities on The Yields of Green and Dry Fodder for Egyptian Clover (Meskawi)

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Abstract

A field experiment was carried out at Abu Al-Fadl Forest Nursery affiliated to Al-Diwaniyah Agriculture Directorate (2 km away from the city center), during the winter season (2020-2021). In order to determine the best combination of NPK fertilizer under influence of different seeding rates to shorten the life of cutting the first To increase cutting number during the growing season and to improve the quantity and quality of green and dry fodder and seed yield. The experiment includes six combinations of NPK fertilizer are (0-0-0 , (20-15-10), (40-30-20), (60-45-30), (80-60-40) and (100-75-50) kg ha\(^{-1}\), and four of seeding rates are (20, 40, 60, 80) kg ha\(^{-1}\). The experiment was applied according to the arrangement of the split plots and using R.C.B Design with three replications. The combination of NPK fertilizer were placed in the main-plot and the quantities of seeds in the sub-plot. The results showed that NPK5 fertilizer level excelled the yields of green and dry forage for the fourth cutting (20.98 , 2.28) ton ha\(^{-1}\) respectively, and The total green and dry fodder yields (60.87 , 6.48 ) ton ha\(^{-1}\) respectively. While the fertilizer level NPK4 exceeded The ratio of leaves to stems for the fourth cutting (37.61%). As for the of seeding rates, the results showed that (80 kg h\(^{-1}\)) excelled for the ratio of leaves to stems for third cutting (34.67%) yields of green and dry fodder for the first cutting (9.92 , 1.03) ton ha\(^{-1}\) respectively, and the total green fodder yield (59.40 t.h-1), While the 60 kg h\(^{-1}\) excelled the yields of green fodder for the second, third and fourth cutting (13.04, 19.50 and 17.64) ton ha\(^{-1}\), dry forage yield of the second, third and fourth cutting (1.47, 1.94, and 1.90) ton ha\(^{-1}\) sequentially, and the total dry fodder yield (6.25) ton ha\(^{-1}\).

Keywords: Fertilizer, Quantities, Meskawi, Fodder.

1. Introduction

The Egyptian clover (\textit{Trifolium alexandrinum} L.) is one of the leguminous crops that is well grown in areas with moderate winter surroundings and from Iraq. The Egyptian alfalfa is almost complete food for animals. The high percentage of indigestible crude protein with high nutritional value reaches (16.51%), and It is rich in calcium, phosphorous, carotene and vitamins, which makes it used in the form of green fodder, silage or hay, which made it ranked second in Iraq in terms of importance and area. Supplying one of the most productive winter forage plants in central Iraq [1]. The Egyptian clover (Musqawi cultivar) is distinguished by its short stems below the cut area, which have the ability to form buds that reveal new growths, thus it is possible to take several cuttings during the season, and it gives a yield of green fodder ranging from (40-60) ton ha\(^{-1}\) [2], and this depends on the operations of servicing the crop according to the correct scientific foundations, which include several operations, including fertilization with major elements, as NPK fertilizer is necessary for plant growth and no plant can complete its life cycle in the absence of one of these elements, the importance of nitrogen comes because it enters into the formation of compounds Important such as enzymatic chaperones (NAD, NADP), nitrogenous bases, nucleic acids, amino acids, protoplasm formation, chlorophyll, growth regulators and other compounds that enter into the building of the plant cell [3]. As for phosphorous, it is included in important compounds such as DNA, RNA and phosphorylated lipids and in the formation of enzymatic chaperones (NAD, NADP) and energy compounds GTP, ATP. While potassium controls the permeability of cytoplasmic membranes and has an important role in the process of closing and opening stomata, it activates many enzymes, affects the formation of sugars, starches, fats and proteins, and stimulates processes related to energy transfer and other vital processes [4].

As[5] indicated in their study of the effect of different levels of phosphorus on the yield of jet that there was a significant increase in the yield of green fodder with an increase in the amount of phosphorous fertilizer compared to treatments that
were not fertilized, and between [6] in studying the effect of different levels of potassium fertilizer. In irrigated alfalfa yield, there was a significant increase in the yield of green and dry fodder with an increase in the fertilizer level. Observed[7] when studying the effect of different levels of nitrogen fertilizer on irrigated alfalfa, that there was a significant increase in the yield of fodder, green and dry with an increase in the amount of nitrogen fertilizer added. As [8] from Purdue University, USA, stated that there is a linear response of green and dry forage yields of jet with increased levels of phosphate fertilizer. Indicated [9] in their study of the effect of potassium fertilizer levels on irrigated alfalfa to a significant increase in green and dry forage yield. In all beds with an increase in the amount of potassium fertilizer added.

As for the quantities of seeds, it determines the number of plants in a unit area, and its increase is accompanied by an increase in plant density, which affects by increasing competition for growth factors (water, light and nutrients), and reducing them reduces the number of plants per unit area, which may be reflected negatively On the yield of forage, as the yield of forage and other vegetative characteristics differ according to the different seed quantities of alfalfa, the experiments of [10] and [11] indicated a significant increase in the yield of green forage when increasing seed quantities, and it was found [12] showed that the increase in seed quantities of Egyptian alfalfa led to a significant increase in the yield of green forage As [13], when studying the effect of different seed quantities on the growth and yield of irrigated alfalfa, indicated that there was a significant increase in the yield of green and dry fodder with an increase in the quantity of seeds. They found[14] that the dry matter yield of Egyptian alfalfa increased with the increase in seed quantities. A decrease in the percentage of leaves to stems with an increase in the quantity of seeds, and between [15] that an increase in the seed quantity of Egyptian alfalfa led to a significant increase in the yields of green and dry forage for all weeds.

And given the importance of the livestock sector, which occupies a key place in the national economy and a stable agricultural system and a fundamental pillar in achieving food security, and the development of this wealth is one of the things imposed by the increasing need for animal products to meet human food needs. However, the decline in the productivity and quality of the available fodder, the limited feed resources and its inability to meet the necessary and sufficient food needs of animals, as well as the high prices of it, are among the problems that stand in the way of the development of this sector, which created a deficit in animal products due to the increasing demand for them. Therefore, researchers have to pay attention to feed production and improve it in terms of quantity and quality, and increase its sources, which are currently limited to the cultivation of barley and jet crops during the winter season. The experiment aims to determine the best combination of NPK fertilizer, with which we guarantee to reduce the state of competition between growing plants under the influence of different seed quantities to increase the number of weeds during the growing season to raise the quantity and quality of green and dry fodder. That is why this experiment was carried out with the aim of determining the best combination of NPK fertilizer, with which we guarantee to reduce the state of competition between the growing plants under the influence of different seed quantities to increase the number of cutting during the growing season to raise the quantity and quality of green and dry forage yields.

2. Material and Methods

2.1 Experimental Site and Soil Characteristics

A field experiment was carried out in Al-Diwaniyah Governorate during the winter agricultural season (2020/2021), with the aim of determining the best combination of NPK fertilizer, including reducing the state of competition between plants under different influence. 30 cm), and then mixed through a sample of a composite sample that was dried and pneumatically and passed a sieve with holes diameter of 2mm, and some chemical and physical analyzes were conducted on it before carrying out the experiment. The soil was clay loam, having pH 7.30, electrical conductivity (EC) 1.70 dSm⁻¹, available P 13.00 mg kg⁻¹, available K 147.70 mg kg⁻¹, and available N 65.00 mg kg⁻¹.

2.2 Experimental Design and Treatments

The experiment included the study of two factors: The first factor: It included six combinations of NPK fertilizers (0-0-0), (20-15-10), (40-30-20), (60-45-30) and (80-60-40) and (100-75-50) kg ha⁻¹ as it is symbolized by the symbols (NPK0, NPK1, NPK2, NPK3, NPK4 and NPK5) Use triple superphosphate fertilizer as a source of phosphorus (46% P) and urea fertilizer (46% N) as a source of nitrogen, as for potassium, potassium sulfate fertilizer (42% K) was used as a source to add it, and mixtures of NPK fertilizer were added in batches and as shown (N: two equal batches, the first at the completion of emergence and the second after the third mowing, P: added at once when Cultivation, P: two equal batches, the first at the completion of the emergence and the second after the fourth mowing). The second factor: It included four seed quantities (20, 40, 60 and 80) kg ha⁻¹. The quantities were given the following symbols: S1, S2, S3, and S4 in sequence. The experiment was carried out in a one-time split-plot-design method, using a randomized complete block design (R.C.B.D) and with three replications, NPK fertilizer combinations filled the main plates (Main-plots), while the quantities of seeds filled the secondary plates (Sub-plot).
2.3 Field Operations

The experimental land was plowed twice and perpendicularly by using the flip-floor plow, then smoothed using the disc harrows, and then it was leveled by the leveling machine, and it was divided according to the design used into boards with an area of \((2 \times 3 = 6 \text{ m}^2)\), the waterways were opened and the shoulders were made between the boards, leaving a distance of 50 cm Between the secondary panels and a distance of 200 cm between the main panels and between one sector and another to maintain that the fertilizer mixtures (NPK) do not overlap between the experimental units. Alfalfa seeds were sown in the scattering method on 10/15/2020 and were covered with soil, then the germination irrigation was given immediately after the planting process was completed and with complete control over the water flow to avoid the erosion of the seeds. The other irrigations were given according to actual need. The plants were manually tamped whenever they reached a height of about 40 cm leaving a height of 6-9 cm above the soil surface[16] .

2.4 Studied Attributes

Measurements were taken at each edge of the bed and at a height of 40 cm for each characteristic of leaf to stem weight (%), which was calculated as a percentage of leaf weight to stem weight for five plants randomly taken from each experimental unit according to the following equation: \(( \text{leaf weight to stem} \%) = \frac{\text{Weight of leaves}}{\text{weight of stems}} \times 100\) The recipe for the yield of green fodder for each plantation \((\text{ton ha}^{-1})\) The yield of green fodder for each plantation was calculated from an area \((0.5 \times 0.5 = 0.25 \text{ m}^2)\), taking into account the start of the mowing process after the dew on the leaves of the plants Then the fodder yield was weighed directly by means of an electronic scale to avoid moisture loss, then it was converted from \((\text{kg m}^{-2})\) to \((\text{ton ha}^{-1})\) and the recipe of the dry fodder yield for each plantation \((\text{ton ha}^{-1})\) The dry yield of the forage for each plantation was calculated. Depending on the procedure of air drying process, then oven drying until the weight of the green fodder yield is stable (moisture content 10-12%), then it is converted from \((\text{kg m}^{-2})\) to \((\text{ton ha}^{-1})\) and the recipe for the total green fodder yield \((\text{ton ha}^{-1})\) was calculated as a sum of the yield of green fodder for all the weeds The recipe of the total dry forage yield \((\text{ton ha}^{-1})\) was calculated as the sum of the dry forage yield of all mowers.

2.5 Statistical Analysis

After collecting, reducing and tabulating the data, it was statistically analyzed using the GENESTAT program according to the data analysis tool, and the averages of the coefficients were compared using the Least Significant Difference (LSD) test at the probability level of 0.05.

3. Results

3.1 Leaf to Stem Ratio (%)

The results of the statistical analysis in Table (1) indicated the moral effect of seed quantities in the first and third cutting, while the moral effect of NPK fertilizer levels was limited to the fourth cutting only, and the interaction between seed quantities and NPK fertilizer levels had no significant effect in this characteristic. It was noticed from the results in Table (6) that the quantity of seed S1 was significantly superior to the rest of the quantity of seed in the first cutting, as it recorded the highest average amounted to 44.09% and without a significant difference from the quantity of seed S2 which recorded an average of 41.50%, While the quantity of seed S4 recorded the lowest average amounting to 37.96%,In the third cutting, the quantity of S4 seed surpassed and recorded the highest average of 34.67%, without significant difference from the quantities of S2 and S3 seed, which recorded averages of 33.33% and 34.04% respectively, While the quantity of seed S1 recorded a significant decrease in this trait and gave the lowest average of 30.79%.

As for the fertilizer treatments, the results showed that the level of NPK4 was superior to the rest of the added NPK treatments, and it gave the highest mean of the fourth cutting, which amounted to 37.61%, without significant difference from the treatment of NPK5, with an average of 33.77%, While the NPK1 level gave the lowest average of 30.33%.
The effect of seed quantities and NPK fertilizer treatments and the interaction between them on the Leaf to Stem Ratio (%).

| NPK  | S4  | S3  | S2  | S1  | NPK treatments | NPK  | S4  | S3  | S2  | S1  | NPK treatments |
|------|-----|-----|-----|-----|----------------|------|-----|-----|-----|-----|----------------|
| NPK0 | 38.75 | 44.54 | 40.78 | 36.53 | 33.14 | NPK0 | 41.05 | 34.5 | 41.65 | 42.1 | 45.93  |
| NPK1 | 37.40 | 38.69 | 38.7 | 35.65 | 36.56 | NPK1 | 41.24 | 38.07 | 41.5 | 41.33 | 44.04  |
| NPK2 | 40.89 | 40.86 | 43.33 | 41.01 | 38.37 | NPK2 | 40.95 | 39.88 | 36.9 | 42.83 | 44.2  |
| NPK3 | 38.81 | 38.31 | 41.12 | 39.69 | 36.11 | NPK3 | 40.99 | 38.79 | 39.35 | 40.84 | 44.97  |
| NPK4 | 41.52 | 44.13 | 40.24 | 38.3 | 43.39 | NPK4 | 40.82 | 38.21 | 40.31 | 41.45 | 43.3  |
| NPK5 | 37.19 | 35.35 | 39.88 | 38.73 | 34.82 | NPK5 | 39.55 | 38.32 | 37.3 | 40.45 | 42.11 |

The effect of seed quantities and NPK fertilizer treatments and the interaction between them on the Leaf to Stem Ratio (%).

| NPK  | S4  | S3  | S2  | S1  | NPK treatments | NPK  | S4  | S3  | S2  | S1  | NPK treatments |
|------|-----|-----|-----|-----|----------------|------|-----|-----|-----|-----|----------------|
| NPK0 | 38.75 | 44.54 | 40.78 | 36.53 | 33.14 | NPK0 | 41.05 | 34.5 | 41.65 | 42.1 | 45.93  |
| NPK1 | 37.40 | 38.69 | 38.7 | 35.65 | 36.56 | NPK1 | 41.24 | 38.07 | 41.5 | 41.33 | 44.04  |
| NPK2 | 40.89 | 40.86 | 43.33 | 41.01 | 38.37 | NPK2 | 40.95 | 39.88 | 36.9 | 42.83 | 44.2  |
| NPK3 | 38.81 | 38.31 | 41.12 | 39.69 | 36.11 | NPK3 | 40.99 | 38.79 | 39.35 | 40.84 | 44.97  |
| NPK4 | 41.52 | 44.13 | 40.24 | 38.3 | 43.39 | NPK4 | 40.82 | 38.21 | 40.31 | 41.45 | 43.3  |
| NPK5 | 37.19 | 35.35 | 39.88 | 38.73 | 34.82 | NPK5 | 39.55 | 38.32 | 37.3 | 40.45 | 42.11 |

3.2 Yield of green fodder for cutting (ton ha⁻¹)

The results of the statistical analysis in Table (2) indicated that there was a significant effect of seed quantities on the yield of green forage for all cutting. While the significant effect of NPK fertilizer levels was limited in the fourth cutting only, while the interaction had no significant effect on this trait. It was noticed from the results in Table (2) that the quantity of S4 seed was significantly superior to the rest of the quantity of seed in the first cut, as it recorded the highest average of 9.92 tons ha⁻¹. In the second, third and fourth cuts, the quantity of seed S3 was significantly superior to the rest of the seed quantities that recorded the highest The averages amounted to (13.04, 19.50 and 17.64) ton ha⁻¹, respectively. In the second, third and fourth cutting, the quantity of S3 seed significantly outperformed the rest of the seed quantities that recorded the highest averages, as they reached (13.04, 19.50 and 17.64) tons ha⁻¹, respectively. While the quantity of seed S1 recorded the lowest averages, which amounted to (6.91, 11.34, 16.37 and 14.90) tons ha⁻¹ for the cutting, respectively. Either with respect to the rest of the cutting interval (second, third and fourth), the superiority of the quantity of seed S3 to S4 if it is not significant (except for the third cutting). As its averages at (13.04 , 19.50 and 17.64) ton ha⁻¹ for the cutting respectively, while given The quantity of seed S1 was the lowest average for this trait, which amounted to (6.91, 11.34, 16.37 and 14.90) tons ha⁻¹ for the cutting, respectively.

As for the levels of NPK fertilizer, the results in Table (2) showed the superiority of the NPK5 treatment over the rest of the treatments and gave the highest average of the fourth cutting amounting to 20.98 tons ha⁻¹ without significant difference from the NPK4 treatment, which averaged 20.25 tons ha⁻¹, while the NPK2 treatment gave The lowest average for the trait was 18.84 ton ha⁻¹.
Table 2. The effect of seed quantities and NPK fertilizer treatments and the interaction between them on Yield of green fodder for cutting (ton ha\(^{-1}\)).

| NPK   | S4    | S3    | S2    | S1    | NPK treatments | average | NPK   | S4    | S3    | S2    | S1    | NPK treatments |
|-------|-------|-------|-------|-------|----------------|---------|-------|-------|-------|-------|-------|----------------|
| 12.63 | 13.07 | 13.41 | 12.52 | 11.51 | NPK0           | 6.58    | 8.43  | 6.93  | 6.01  | 4.93  | NPK0           |
| 12.72 | 13.77 | 13.44 | 12.37 | 11.31 | NPK             | 9.00    | 11.52 | 10.04 | 8.04  | 6.40  | NPK1           |
| 11.73 | 12.49 | 12.56 | 11.19 | 10.69 | NPK2           | 8.84    | 11.24 | 9.51  | 8.69  | 5.91  | NPK2           |
| 12.22 | 12.73 | 13.36 | 11.77 | 11.03 | NPK3           | 9.15    | 10.25 | 8.79  | 9.08  | 8.48  | NPK3           |
| 12.25 | 11.96 | 12.95 | 11.56 | 12.53 | NPK4           | 7.72    | 9.47  | 7.85  | 7.51  | 6.05  | NPK4           |
| 11.75 | 12.25 | 12.51 | 11.31 | 10.95 | NPK5           | 9.56    | 8.59  | 9.97  | 9.97  | 9.69  | NPK5           |

3.3 Yield of dry fodder for cutting (ton ha\(^{-1}\))

The results of the statistical analysis indicated in Table (3) the significant effect of the quantities of seeds in all cutting and the levels of NPK fertilizer in the fourth cutting only, and the interaction did not have a significant effect on this trait.

It was shown from the results in Table (3) that the quantity of S4 seed was significantly superior to the rest of the seed quantities for the first cut, as it recorded the highest average of 1.03 tons ha\(^{-1}\). In the second, third and fourth cutting, the quantity of S3 seed was significantly superior to the rest of the seed quantities. The highest averages of (1.47, 1.94 and 1.90) tons ha\(^{-1}\) were recorded in sequence, while the quantity of seed S1 recorded the lowest averages for the four cutting, which amounted to (0.77, 1.27, 1.62 and 1.52) tons ha\(^{-1}\), respectively.

As for the levels of NPK fertilizer, the results in Table (3) showed the superiority of the NPK5 fertilizer treatment over the rest of the treatments and it gave the highest average of the fourth cutting amounting to 2.28 tons ha\(^{-1}\) and without a significant difference from the NPK4 treatment, which averaged 2.23 tons ha\(^{-1}\), while the treatment of NPK fertilizer gave NPK2 had the lowest average for the trait, which was 1.94 tons ha\(^{-1}\), and the results showed that the plants of the control treatment (NPK0) did not reach the height required for cutting on the tenth of April.
Table 3. The effect of seed quantities and NPK fertilizer treatments and the interaction between them on Yield of dry fodder for cutting (ton ha\(^{-1}\)).

|        | Second cutting | NPK treatments | average seed quantities | NPK treatments | first cutting | NPK treatments | average seed quantities |
|--------|----------------|----------------|--------------------------|----------------|---------------|----------------|--------------------------|
|        |                |                | S4  | S3  | S2  | S1  |                | S4  | S3  | S2  | S1  |                |
| 1.42   | NPK0           | 1.03           | 0.89 | 0.76 | 0.65 | NPK0           | 1.03           | 0.89 | 0.76 | 0.65 | NPK0           | 1.03           | 0.89 | 0.76 | 0.65 |
| 1.35   | NPK1           | 1.13           | 1.03 | 0.88 | 0.69 | NPK1           | 1.13           | 1.03 | 0.88 | 0.69 | NPK1           | 1.13           | 1.03 | 0.88 | 0.69 |
| 1.35   | NPK2           | 1.19           | 1.03 | 1.1  | 0.74 | NPK2           | 1.19           | 1.03 | 1.1  | 0.74 | NPK2           | 1.19           | 1.03 | 1.1  | 0.74 |
| 1.44   | NPK3           | 1.00           | 0.81 | 0.94 | 0.90 | NPK3           | 1.00           | 0.81 | 0.94 | 0.90 | NPK3           | 1.00           | 0.81 | 0.94 | 0.90 |
| 1.35   | NPK4           | 0.94           | 0.77 | 0.75 | 0.64 | NPK4           | 0.94           | 0.77 | 0.75 | 0.64 | NPK4           | 0.94           | 0.77 | 0.75 | 0.64 |
| 1.30   | NPK5           | 0.89           | 1.05 | 1.02 | 1.03 | NPK5           | 0.89           | 1.05 | 1.02 | 1.03 | NPK5           | 0.89           | 1.05 | 1.02 | 1.03 |

|        | NPK treatments | average seed quantity | NPK treatments | average seed quantity | NPK treatments | average seed quantity | NPK treatments |
|--------|----------------|-----------------------|----------------|-----------------------|----------------|-----------------------|----------------|
|        |                | 1.03                  | 0.93           | 0.91                  | 0.90           | 0.94                  | 0.89           |
|        |                | 0.91                  | 0.81           | 0.81                  | 0.81           | 0.81                  | 0.81           |
|        |                | 0.94                  | 0.77           | 0.75                  | 0.75           | 0.75                  | 0.75           |
|        |                | 0.89                  | 1.05           | 1.02                  | 1.02           | 1.02                  | 1.02           |

3.4 Total green fodder yield (ton ha\(^{-1}\))

The results of the statistical analysis in Table (4) indicated that there was a significant effect of seed quantities and levels of NPK fertilizer on the trait of total green fodder yield, while the interaction had no significant effect in this trait.

It was noticed from the results in Table (4) that the quantity of S4 seed was superior to the rest of the seed quantities, as it recorded the highest average, which amounted to 59.40 tons ha\(^{-1}\) and without significant difference from the quantity of seed S3, which averaged 59.03 tons ha\(^{-1}\), while the quantity of seed S1 gave less Average for the trait was 49.52 ton ha\(^{-1}\).

As for the NPK fertilizer treatments, it was noted that the NPK5 treatment recorded the highest mean of the total green fodder yield, which amounted to 60.87 tons ha\(^{-1}\), without significant difference from the treatments NPK4, NPK3, NPK2 and NPK1, all of which were significantly superior to the comparison treatment NPK0, which recorded the lowest average of It reached 37.04 ton ha\(^{-1}\).
Table 4. The effect of seed quantities and NPK fertilizer treatments and the interaction between them on Total green fodder yield (ton ha$^{-1}$).

| NPK treatments | average seed quantity | S4   | S3   | S2   | S1   |
|----------------|-----------------------|------|------|------|------|
| NPK0           | 31.75                 | 40.83| 39.61| 39.61| 37.04|
| NPK1           | 51.61                 | 66.01| 63.73| 57.92| 51.61|
| NPK2           | 62.88                 | 62.88| 61.83| 55.71| 50.19|
| NPK3           | 62.69                 | 62.69| 62.07| 56.55| 53.59|
| NPK4           | 60.95                 | 60.95| 62.32| 57.16| 53.65|
| NPK5           | 63.04                 | 63.04| 64.63| 59.48| 56.33|
| L.S.D value(0.05) | 1.19               | 3.85 | 59.03| 53.8 | 49.52 |

3.5 Total dry forage yield (ton ha$^{-1}$)

The results of the statistical analysis in Table (5) indicated that there was a significant effect of seed quantities and NPK fertilizer treatments on the total dry forage yield, while the interaction had no significant effect on this trait.

It was noticed from the results in Table (5) that the quantity of S3 seed was significantly superior to the rest of the seed quantities, as it recorded the highest average amount of 6.25 tons ha$^{-1}$ and without a significant difference from the quantity of seed S4, which recorded an average of 6.22 tons ha$^{-1}$, while the quantity of seed S1 gave less Average for the trait was 5.20 ton ha$^{-1}$. As for the NPK fertilizer treatments, the results in Table (5) showed the superiority of the NPK5 treatment to the rest of the NPK treatments, as it gave the highest average of 6.48 tons ha$^{-1}$ and without significant difference from the treatments of NPK4, NPK3, NPK2 and NPK1 while the NPK0 treatment gave the lowest average. It amounted to 4.01 ton ha$^{-1}$.

Table 5. The effect of seed quantities and NPK fertilizer treatments and the interaction between them on Total Dry fodder yield (ton ha$^{-1}$).

| NPK treatments | average seed quantity | S4   | S3   | S2   | S1   |
|----------------|-----------------------|------|------|------|------|
| NPK0           | 4.01                  | 4.38 | 4.31 | 3.81 | 3.53 |
| NPK1           | 6.10                  | 6.68 | 6.67 | 5.85 | 5.19 |
| NPK2           | 6.13                  | 6.54 | 6.50 | 6.01 | 5.48 |
| NPK3           | 6.04                  | 6.30 | 6.46 | 5.82 | 5.57 |
| NPK4           | 6.25                  | 6.70 | 6.59 | 6.12 | 5.61 |
| NPK5           | 6.48                  | 6.74 | 6.98 | 6.38 | 5.85 |
| L.S.D value(0.05) | 0.18                   | 0.59 |      |      |      |

4. Discussion

The results of the statistical analysis indicated the moral effect of the quantities of seeds in the first and third cuts, while the moral effect of NPK fertilizer levels was limited in the fourth cut only. The reason for the superiority of the amount of S1 seeds in the first cut can be attributed to the decrease in competition between plants as a result of the small number of plants.
per unit area, which provided an opportunity for plants to obtain growth factors (light, water and nutrients) better, which encouraged their vegetative growth, which was reflected in the increase in the number of leaves or their area, which increased their ratio compared to stems, especially that they are in their early stages of growth, where the soft stems are low in fiber.[17] and [18]. As for the third stage, it is a late stage in the life of the plant if a fodder yield is desired, which is associated with high temperatures, which play a major role in accelerating growth, which reduces the size of the differences under the influence of other factors, as well as the rush of plants to an abundance in the formation of lateral or basal branches due to an increase. The activity of the buds as a natural result of the increase in the concentrations of nitrogen, phosphorous and potassium in the plant, which increases the metabolic rates and what is stored in the storage sites. Completely, especially the leaves, which increased its percentage with high seed quantity S4[19].

As for the fertilizer treatments, the reason for this may be attributed to the increase in the concentrations of nitrogen, phosphorous and potassium in the plant and their great role in physiological processes, especially the photosynthesis process, the construction of chlorophyll and the formation of plastids, as well as the encouragement of cell division and expansion, which means the formation of good vegetative and root growth that positively reflected on the growth characteristics, including the leaves. Which encourages an increase in its percentage [20] and [21]. The study showed that there was a significant effect of seed quantities on the yield of green fodder for all mowings, while the significant effect of NPK fertilizer levels was limited to the fourth mowing only. The reason for this may be due to the fact that the increase in seed quantities (S4) results in an increase in plant density, which leads to an increase in the quantity of seeds. Forage resulting from the first cut. As for the rest of the weeds (the second, third and fourth), it can be explained on the basis of the repetition of the mowing that pushes the plants towards the abundance of branching, which leads to an increase in the intensity of competition between plants, which negatively affects growth as a result of competition for growth factors (water, light and nutrients), and this weakens the Its growth, even relatively, at the highest amount of seeds S4, as a result of the available growth factors, and this pushes towards the superiority of the lowest amount of seeds, which is S3, which may have created a state of balance between the number of plants per unit area and the resources available to them, Which was clearly reflected on the increase in forage yield and in all weeds, [22] and [23]. As for the levels of NPK fertilizer, the reason for giving the high levels of fertilization the highest fodder yield is due to the increase in nitrogen, phosphorous and potassium concentrations and its direct and indirect role in most metabolic and physiological processes, including the formation of energy-rich compounds, enzymes and enzymatic companions and activating their work as they help in the division, elongation and expansion of cells and stimulate growth and development, so its availability in sufficient quantities and ready for the plant during the growth stages is of great importance to increase the yield of green and dry fodder for forage crops and improve their productivity and quality, [24] and [25]. The study showed a significant effect of the quantities of seeds and NPK fertilizer treatments on the total dry yield. The reason for this may be due to the superiority of the quantities of seeds S3 and S4 in the dry forage yield of weeds (Table 3), which together determine the amount of total dry forage[26]. As for the treatments of NPK fertilizer, the reason for this may be attributed to the superiority of the mentioned treatments in the dry forage yield for each plant (Table 3). It was also noted from the results that all treatments were significantly superior to the comparison treatment, but the superiority was uneven from one treatment to another, and this confirms the role and importance of fertilizer Additive NPK in promoting growth and increasing forage yield [27] and [28].

Conclusions

- The use of high seed quantities S3 and S4 (60, 80) kg ha\(^{-1}\) achieved the best two quantities of green and dry forage yields.
- Increasing the total yield of green and dry fodder with an increase in the amount of NPK fertilizer, with a clear and simple fluctuation in the percentages of increase and decrease between the weeds in forage yields from the first to the fourth, compared to the comparison treatment (without adding fertilizer) which gave the least amount of green and dry fodder
- An increase in the yields of green and dry fodder when the quantities of S3 and S4 seeds (60, 80) kg ha\(^{-1}\) were overlapped with all NPK fertilizer treatments except for the comparison that recorded the lowest averages with all seed quantities.

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