Assessment of Sorghum (*Sorghum bicolor* L.) Productivity under Different Weed Control Methods, Mineral and Nano Fertilization

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ABSTRACT

Two field experiments were carried out at the Experimental Farm, Faculty of Agriculture (Saba Basha), Alexandria University, Egypt during 2017 and 2018 seasons, to study the effect of mineral, nano-fertilization, in addition to different weed control on growth and yield of sorghum. Split plot design with three replicates was used, where the main plots occupied by weed control treatments(hand hoeing one time before the first irrigation, hand hoeing twice the first one was before the first irrigation and the second one was before the second irrigation, Heraty sowing method, herbicide treatment before planting and herbicide treatment before planting + one hand hoeing), meanwhile, the combination between NPK mineral and NPK nanoparticles fertilizers (100% mineral NPK (240:60:60 kg/ha), 100% nano NPK (5 L/ha) and 50 % mineral NPK + 50 % nano NPK) were distributed at random within the subplots. Each subplot consisted of 5 ridges 3.50 m in length and 60 cm in the width and the plot area was 10.5 m². The results revealed that, the yield and its components of the sorghum hybrid (Horas) were affected by weed control methods, mineral NPK, Nano NPK and their interaction. The highest value of yield characters of sorghum was achieved when applying hand hoeing one time with herbicide with fertilizing by 50% NPK mineral + 50% NPK NPs fertilization, also these treatments reducing the effect of weeds under Alexandria conditions.

INTRODUCTION

Sorghum (*Sorghum bicolor* L. Moench) is one of the three most important cereal crops worldwide after wheat, rice, maize and barley and it’s an important staple food crop in Africa, South Asia and Central America. Sorghum is high yielding, easy to process, readily digested and cheaper than other crops and consumed as food and fodder. The world cultivated area in the world was 40.7 million ha produced up to 57.6 million tons of grains but in Egypt occupied about 147961ha producing up to 727648 tons of grains (FAO,
Sorghum is the 5th leading cereal grain produced worldwide because sorghum is tolerant of heat and drought stress it is commonly grown under non irrigated condition in semiarid parts of the world (Kaufman et al., 2013).

Nanotechnology is the study of manipulating matter on an atomic or a molecular scale that deals with particle sizes between 1 and 100 nanometers at least in one dimension. This technology has the possibility to develop the agricultural and food production with new tools for the molecular treatment of diseases, rapid disease detection, increasing the ability of plants to absorb nutrients etc. Materials reduced to the nanoscale show some properties which are different from what they exhibit on a microscale, enabling unique systemic applications. Nanoparticles, thus, take advantage of their dramatically increased surface area to volume ratio. Nano-fertilizers postpone the release of nutrients and extended the period of fertilizer effects. Obviously, there was an opportunity for nanotechnology to significantly affect energy and the environment by enhancing fertilizers (Naderi and Danesh-Shahraki, 2013).

Using nanoparticles (NPs) in agriculture has beneficial values for plant growth and development due to their relatively greater absorbance and high reactivity (Liu and Lal, 2015). Using nano-fertilizers as a foliar spray at vegetative, flowering or filling stages increased the yield and yield components of faba beans (Gomaa et al., 2016). Nano fertilizers can improve morphological and agronomic characteristics of sorghum and can be useful for goals sustainable an agriculture (Mir, 2015). Fertilizing the maize with a foliar application of nano- fertilizer (PK) and a soil application of mineral fertilizer (PK) improved maize yield (Gomaa et al., 2017). The plant height, yield and yield components of the wheat crop increased after the application of nano-fertilizer (Kandil and Marie, 2017). On the other hand, (Al-Juthery et al., 2018a) found that when compared to the same quantity of 11 essential nutrients nano-fertilizers were significantly superior for all growth parameters. A significant response will be spraying combined of tri (N+P+K), di (N+P), (N+K) and (P+K) nano-fertilizer compared to control and traditional (NPK+TE) fertilizer treatments in all growth and yield parameters of wheat with an increment of the foliar spray. The highest fertilizer productivity was achieved when spraying treatments of nano mixture of (N+P+K) fertilizers compared to traditional fertilizer (Al-Juthery et al., 2018b). The application of nano-fertilizer (NPs) promoted growth, development and antioxidant activity in sugar beet plants and improved crop production and plant nutrition. Moreover, nano-fertilizers have a great effect on the soil and can reduce fertilizer application frequencies (Dewdar et al., 2018). Using NPs with NPK nutrients increased the yield and its components of wheat compared with fertilization of mineral NPK in both seasons (Abdelsalam et al., 2019). This investigation aimed to study the response of maize yields and its components to organic manure (compost) and different potassium sources.

Nitrogen is a key factor for plant photosynthesis, ecosystem productivity and leaf respiration (Martin et al., 2008). Nitrogen stress may affect the light use efficiency and consequently influence long-term changes in vegetation biomass and carbon sequestration (Peng et al., 2012). Increase nitrogenous fertilization rates up to 200 kg/ha increased yield and its components of maize (Dawadi and Sah, 2012). Nitrogen fertilization levels, maize hybrids and their interactions showed such significant effects on maize growth, crop yield and its components. The maximum values of crop growth and yield characters (Kandil, 2013). There were gradual and significant increases in all growth parameters and grain yield resulted from foliar spray by raising N-fertilizer up to 288 kg N/ha (Faheed et al., 2016). The highest means values of yield and chemical composition characters were obtained using nitrogen fertilizer at the rate of 384 kg/ha, in both seasons, while the lowestones were recorded by application of nitrogen at 192 kg/ha, in both seasons (Gomaa et al., 2016).
Phosphorus (P) is essential for enhancing seed maturity and seed development (Ziadi et al., 2008). Both P and K application favored tillering of crops and reduced lodging in crops (Liakas et al., 2001), developed photosynthetic activity and transport to the ripening grains and recorded the highest values of grain yield (Crista et al., 2012; Rietra et al., 2017; Hadis et al., 2018). With adequate levels of phosphorus, 20% more grain yield of wheat can be obtained (Abdel-Aziz et al., 2016). N and P uptake could be increased with increased P additions (Abdel-Aziz et al., 2018).

Potassium (K) helps in photosynthesis process, controlling water storage and stomata opening in leaves (Zhang and Wang, 2005). Potassium is an important macronutrient for improving the yield of the crop. It is vital for physiological processes, water availability, photosynthesis, assimilate transport and enzyme activation with a direct effect on crop production. Potassium absence significantly reduces the leaves number and size of individual leaf and as a result, photosynthetic activity of the plant was affected (William, 2008). Higher crop growth rate might be exhibited due to higher photosynthetic efficiency in leaves and supplied emerging cobs with existing photosynthates for proper filling, producing a higher yield. Grain yield enhanced by increasing potassium uptake under the arid condition (Damon and Rengel, 2008).

Weed infestation is one of the major threats to cereal production in Egypt. Weed could be controlled in crops through cultural, mechanical and chemical methods, the wise use of these individual methods or a combination of them can manage weed effectively without causing economic loss or harming the environment (Magain, 2008). Weed control in grain sorghum is a challenge because of the limited number of herbicides available to growers, rotational crop restrictions following a number of herbicides registered for use in sorghum grain, and because of the increased presence of herbicide-resistant weeds. Competition from broadleaf weeds decreased grain yield of sorghum more than grass species competition or mixtures of broadleaf and grass weeds (Feltner et al., 1996). Weed competition the first two weeks after plant emergence has not decreased grain sorghum yields regardless of the weeds studied (Burnside and Wicks., 1967). Period of weed growth beyond two weeks after grain sorghum emergence decreased yields reliant on the weed species and environmental conditions (Smith et al., 1990). Weed herbicides like Metribuzin might have also shorter was lesser persistence its volatility, rapid action and the primary mechanisms of interfering with oxidative and photosynthetic phosphorelation, important better control of weeds compare to alachlor. Similarly, among the cultural measures, intercropping suppressed with lesser weed counts, biomass and nutrient depletion by weeds. This probably because of early germination, stand establishment and ground coverage by the canopy of intercrops (Baldev Ram et al., 2004). Application of both herbicides and hand hoeing, individuals resulted in increased significantly. The combination between hand hoeing with pre- and post-emergency herbicides led to the most effective way for controlling weeds and thus increasing the maize of growth and its yield. Using hoeing twice or once use with one herbicide after the emergency; increased maize growth and yield. The heaviest reduction of weeds was achieved after applying hand hoeing twice or using one hand hoeing with post- emergency herbicides (Kandil and Kordy, 2013). The highest weed control efficiency was recorded with twice hand weeding at 15 and 30 DAS as compared with the other treatments. Application of metribuzin 1.0 kg/ha as weed control + intercropping with blackgram was found to be the most effective to control the weeds as compared to other treatments. The treatment recorded the lowest weed control, weed biomass production. The highest weed control efficiency and higher grain yield (Srinivasaperumal and Kalisudarson, 2019).

This investigation aimed to study the response of the sorghum hybrid productivity to different mineral NPK, nano NPK, weed control methods and their interaction.
MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Farm of Faculty of Agriculture (Saba Basha), Alexandria University, Egypt, during the two summer seasons of 2017 and 2018 to study the response of the sorghum hybrid productivity to different mineral NPK, nano NPK, weed control methods and their interaction.

Before planting the sorghum, the preceding crop was Egyptian clover (berseem) in the first and second season. Soil physical and chemical analysis of the experimental site is given in Table (1). Each subplot consisted of 5 ridges 3.50 m in length and 60 cm in the width and the plot area was 10.5 m².

Split plot design with three replications was used, where the main plots occupied by weed control treatments i.e., 1) hand hoeing one time before the first irrigation, 2) hand hoeing twice, the first one was before the first irrigation and the second one was before the second irrigation, 3) heraty sowing method, 4) herbicide treatment method before planting, and 5) herbicide treatment method before planting + one hand hoeing. Meanwhile, the combination between 100 % NPK mineral (240:60:60 kg/ha), 100% NPK nanoparticles (5 L/ha) and 50 % mineral NPK + 50 % nano NPK. Were distributed at random within the subplots.

Ammonium nitrate (NH₄NO₃- 33.50 N%) was used as the N source which was applied in two equal doses, the first dose was before the first irrigation and the second one was before the second irrigation during both growing seasons. Potassium sulphate (K₂SO₄) form was added, at sowing time, in both seasons. Phosphorus fertilizer was applied before planting in the form of Calcium super phosphate (15.5 % P₂O₅).

The weed herbicide was applied MethaTomp (33 % EC), in which 1 L of MethaTomp contains 330 g from Pendimethalin used as pre- emergency herbicide at the rate of 4.5 L/ha (after sowing and before irrigation) (Fig. 1).

The planting date was at 15th May in both seasons. The field was hand thinned before the first irrigation to 2 plants/hill. Other good agricultural practices were done as recommended by the Ministry of Agriculture and Land Reclamation.
Table 1: Soil physical and chemical properties of the experimental sites in 2017 and 2018 seasons.

| Soil properties | Season | 2017 | 2018 |
|-----------------|--------|------|------|
| A) Mechanical analysis: |
| Clay %          |        | 38.00| 37.00|
| Sand %          |        | 32.00| 33.00|
| Silt %          |        | 30.00| 30.00|
| Soil texture    |        | Clay loam soil |
| B) Chemical properties |
| pH (1:1)        |        | 8.00 | 8.10 |
| EC (dS/m)       |        | 2.99 | 3.20 |
| 1) Soluble cations (1:2) (cmol/kg soil) |
| K+              |        | 1.53 | 1.54 |
| Ca2+            |        | 9.30 | 9.10 |
| Mg2+            |        | 10.30| 12.00|
| Na+             |        | 11.50| 10.60|
| 2) Soluble anions (1:2) (cmol/kg soil) |
| CO3− + HCO3−    |        | 2.80 | 2.70 |
| Cl−             |        | 17.40| 18.00|
| SO42−           |        | 12.60| 12.50|
| Calcium carbonate (%) | | 6.50 | 6.60 |
| Total nitrogen % |        | 1.00 | 0.92 |
| Available phosphate (mg/kg) | | 3.80 | 3.90 |
| Organic matter (%) |      | 1.42 | 1.41 |

Nano-fertilizer (8% total N, 5% total P, 3% total K, 10% micronutrients, 5% Amino acids and 5% Seaweed extract), was foliar sprayed on sorghum plants at 40 and 55 days after sowing (DAS).

Plant height at harvest, 100-grain weight, grain yield, biological yield (ton/ha), harvest index (%) and protein (%) were recorded. From each experimental subplot, one square meter (m²) was selected randomly to identify and collect *Portulaca oleracea*. Plant height (cm), number of plants/m², dry weight (g), leaf chlorophyll content (SPAD) and 1000-seed weight (g) of *Portulaca oleracea* was recorded 75 days after sowing.

All collected data were subjected to analysis of variance according to Gomez and Gomez (1984). Statistical analysis was performed using analysis of variance technique using CoStat computer software package (CoStat, Ver. 6.311., 2005). The least significant difference (LSD at 0.05) was used to compare the treatment means.

**RESULTS AND DISCUSSION**

A) Effect of Weed Control Methods on Sorghum Attributes:

The recorded results in Table (2) showed that plant height (cm), 1000-kernel weight (g), grain yield (t/ha), straw yield (t/ha), biological yield (t/ha), grain protein content (%) of sorghum were significantly affected by weed control methods during two seasons 2017 and 2018.

During the first season 2017, the results cleared that in Table (2) the most effective treatment accused by one hand hoeing + Herbicide. Whereas, all characteristics such as plant height (122.42 cm) at harvesting, 1000-kernel weight (30.54 g), grain yield (2.45 t/ha), straw yield (3.77 t/ha), biological yield (6.22 t/ha), grain protein content (9.60%) of sorghum were significantly increased. Also, the second followed effect achieved by the herbicide alone on the all characteristics were recorded. During the second season 2018, the same trend of applications was repeated and the highest effect of application achieved by one hand hoeing + Herbicide. Whereas, all characteristics as plant height (119.92 cm) at harvesting, 1000-
kernel weight (32.93g), grain yield (2.14t/ha), straw yield (3.57t/ha), biological yield (5.42t/ha), grain protein content (9.13%) of sorghum were significantly increased when compared with other treatments. While, heraty method in the two seasons. The increase in yield and its component of the sorghum plant may be due to the effect of one hoeing plus herbicide. Treatment or herbicide treatment on reducing the number of weeds/m² dry weight of weed/m2 and weed plant the eight as shown in Table (3).These results are in the same trend with those obtained by Feltner et al. (1996); Baldev Ram et al. (2004); Kandil and Kordy (2013); Srinivasaperumal and Kalisudarson (2019) they recorded the role of hoeing and herbicides for reducing the spread of weeds.

B) Effect of Mineral and Nano- Fertilizers on Sorghum Attributes:

The results in Table (2) showed that plant height (cm), 1000- kernel weigh (g), grain yield (t/ha), straw yield (t/ha), biological yield (t/ha), grain protein content (%) of sorghum were significantly affected by combination of mineral NPK fertilization with nano fertilizer during 2017 and 2018 seasons.

Respecting to the effect of mineral and nano- fertilizers, the results in Table (2) revealed that the application of 50 % Mineral NPK fertilizer +50% NPK fertilizer NPs recorded the highest mean values of all studied traits followed by NPK Nanofertilizer (NPs), meanwhile the lowest ones recorded with NPK mineral fertilizer in both seasons. An increase of these traits of sorghum may be due to the role of mineral + nano- fertilizers for increasing yield and its component of sorghum. These results are in the same line with those obtained by Naderi and Danesh-Shahraki (2013); Liu and Lal (2015); Gomaa et al. (2017); Gomaa et al. (2017); Kandil and Marie (2017); Abdel-salam et al. (2019).

C) The Interaction Effect of Weed Control Methods and Mineral + Nano- Fertilizers on Sorghum Attributes:

Respecting to the effect of interaction of method of weed control and mineral and nano- fertilizers, the results in Table (2) showed the significant effect of interaction of weed control methods and mineral and Nanofertilizer, where(hand hoeing one time with herbicide or using herbicide only + 50 % Mineral NPK fertilizer +50% NPK fertilizer NPs) recorded the highest mean values of all traits under study followed by (hand hoeing one time with herbicide + 100% NPK Nanofertilizer NPs), meanwhile, the lowest ones recorded with NPK mineral fertilizer with hearty methods in both seasons.

D) The Effect of Weed Control Methods and Mineral + Nano- Fertilizers on Weed Attributes (*Portulacaoleracea*):

The results in Table (3) showed that *Portulacaoleracea* attributes such as plant height (cm), number of plants/m², dry weight (g), chlorophyll content in leaf (SPAD), and 1000- seed weight (g) were significantly affected by weed controlling methods and combination of mineral NPK fertilization with nanofertilizer and their interaction during 2017 and 2018 seasons.

Table (3) revealed that there was significant effect of weed control methods on *Portulaca oleracea* characters, where the lowest mean values of plant height (cm), number of plants/m², dry weight (g), chlorophyll content in leaf (SPAD), and 1000- grain weight/g recorded with the treatments (One hand hoeing + Herbicide) and by application of herbicides only, while the highest mean values of weed attributes obtained by heraty sowing method followed by using one hand hoeing method in the two seasons. The previous results cleared the role of herbicides for reducing all characters studied of *Portulacaoleracea* grown in sorghum field.

Also, Table (3) cleared the significant effect of mineral and nanofertilizers on *Portulaca oleracea* traits, where the lowest mean values of all studied characters of *Portulaca oleracea*i.e. plant height (cm), number of plants/m², dry weight (g), chlorophyll
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content in leaf (SPAD), and 1000-seed weight were recorded with using 50% mineral NPK + 50% nano NPK as compared with the other treatment.

The interaction between weed control methods and fertilization treatment significantly affected all studied on *Portulaca oleracea* (Table 3).

The many investigators such as Feltner et al. (1996) and Burnside et al. (1967); Smith et al. (1990); Kandil and Kordy (2013); Srinivasaperumal and Kalisudarson (2019) explained the weed competition with crops for light, CO₂, water, and nutrients that may reduce yield and its components.

### Table 2: Plant attributes of sorghum as affected by weed control methods, mineral, Nanofertilizer and their interaction during 2017 and 2018 seasons.

| Treatments | Plant height (cm) | 1000-kernel weight (g) | Grain yield (t/ha) | Straw yield (t/ha) | Biological yield (t/ha) | Grain protein content (%) |
|------------|------------------|------------------------|-------------------|------------------|------------------------|--------------------------|
| 2017       | 2017             | 2017                   | 2017              | 2017             | 2017                   | 2017                     |
| One hand hoeing | 114.00          | 107.00                 | 91.93             | 28.35            | 1.37                   | 1.46                     | 2.00                   | 2.47 | 2.44 | 1.44 | 1.82 | 1.82 |
| Twice hand hoeing | 110.52          | 108.31                 | 82.92             | 30.26            | 1.84                   | 1.73                     | 2.60                   | 2.45 | 4.44 | 4.44 | 7.89 | 7.89 |
| Herbicide (MethoTrol 13% EC) | 118.42          | 116.22                 | 70.18             | 25.00            | 2.02                   | 2.12                     | 2.92                   | 2.74 | 5.20 | 5.20 | 12.95 | 8.25 |
| One hand hoeing + Herbicide | 122.42          | 119.92                 | 69.34             | 25.93            | 2.45                   | 2.14                     | 3.77                   | 5.42 | 6.42 | 6.42 | 12.82 | 7.25 |
| Hoeing method | 146.18          | 104.04                 | 58.72             | 26.18            | 1.90                   | 1.74                     | 2.90                   | 2.64 | 4.49 | 4.49 | 12.35 | 8.84 |
| LSD at 0.05 for A | 4.33             | 4.40                   | 4.82              | 0.35             | 0.34                   | 0.26                     | 0.34                   | 0.28 | 0.24 | 0.24 | 1.16 | 1.16 |

### Table 3: *Portulaca oleracea* as attributes affected by weed control methods, mineral Nanofertilizer and their interaction during 2017 and 2018 seasons.

| Portulaca oleracea | Treatment | Plant height (cm) | Number of plants/m² | Dry weight (g/m²) | Chlorophyll content (SPAD) | 1000-seed weight (g) |
|--------------------|-----------|-------------------|----------------------|-------------------|---------------------------|---------------------|
| 2017               | 2017      | 2017              | 2017                 | 2017              | 2017                      | 2017                |
| One hand hoeing    | 28.92     | 31.75             | 24.83                | 27.00             | 23.33                     | 22.25               | 45.71                 | 42.12 | 0.105 | 0.115 |
| Twice hand hoeing  | 17.83     | 17.33             | 7.57                 | 9.33              | 27.17                     | 27.92               | 43.22                 | 40.05 | 0.149 | 0.159 |
| Herbicide (MethoTrol 13% EC) | 11.00     | 11.83             | 11.17                | 11.50             | 17.00                     | 17.92               | 33.55                 | 27.41 | 0.120 | 0.125 |
| One hand hoeing + Herbicide | 8.50     | 10.00             | 11.00                | 10.50             | 19.67                     | 19.08               | 37.05                 | 37.05 | 0.125 | 0.130 |
| Hoeing method  | 25.33     | 26.75             | 21.83                | 14.17             | 27.83                     | 28.58               | 43.97                 | 40.37 | 0.560 | 0.548 |
| LSD at 0.05 for A | 6.87      | 5.35              | 6.56                 | 7.15              | 8.41                      | 4.60                | 10.72                 | 7.15  | 0.029 | 0.027 |

*: significant difference at 0.05 level probability.
CONCLUSION:

Yield and its components of the sorghum hybrid (Horas) were affected by weed control methods, mineral NPK, Nano NPK, and their interaction. The highest value of yield characters of sorghum was achieved when applying hand hoeing one time with herbicide with fertilizing by 50% NPK mineral + 50% NPK NPs fertilization by reducing growing of weeds under Alexandria conditions.

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ARABIC SUMMARY

نتاجية الذرة الرفيعة تحت تأثير طرق مختلفة لمكافحة الحشائش و التسميد المعدني والنانو

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أقيمت تجارب حقلية في مزرعة كلية الزراعة سابا باشا - منطقة يبس - محافظة الأسكندرية - مصر خلال موسمي الزراعة 2017 و2018 لدراسة تأثير التسميد المعدني والنانو ومكافحة الحشائش على نمو وانتاجية محصول الذرة الرفيعة باستخدام تصميم تجريبي وهو القطب المضاعف مرة واحدة مع التوزيع العشوائي للمعاملات التجريبية.

- أ- أقامة التجارب الحقلية للمحصول تحت الدراسة.

- معاملات مكافحة الحشائش (القطع الرئيسية)
  1- الزيقق مرة واحدة قبل عمليات الري.
  2- الزيقق مرتين قبل رية المحاية ثلاثة.
  3- الزراعة الحراثي (الخضير).
  4- مكافحة كيماوية باستخدام مبيد حشائش (ميثا تومب بمعدل 4.5 لتر/هكتار) بعد الزراعة وقبل الابتقال.
  5- مكافحة كيماوية باستخدام مبيد حشائش (ميثا تومب بمعدل 4 لتر/هكتار) بعد الزراعة وقبل الابتقال + الزيقق مرة واحدة قبل الري الثاني.

- معاملات التسميد (القطع الشقية)
  1- إضافة ارضية للسماد المعدني بالمعدلات الموصية بها (100%) على دفعتين في عمر 20 و15 يوم قبل رية المحاية والري الثانية (بمعدل 240 كجم نتروجين و60 فوسفور و 60 بكتار) + معدل الموسمي به (5 لتر/اقتراص) على دفعتين في عمر 30 و20 يوم.
  2- التسميد الورقي بسماد النانو NPK (بالمعدل الموصى به 5 لتر/هكتار) في عمر 30 و45 يوم من الزراعة.
  3- إضافة ارضية 50% من معدلات السماد المعدني + التسميد الورقي بمعدل 50% من سماد النانو بنفس طرق الاضافة والمواعيد السابقة.

ولخصت النتائج فيما يلي:

أثرت معاملات مكافحة الحشائش تأثير معنويًا على صفات النمو والمصدر والجودة لمحصول الذرة الرفيعة خلال موسمى الزراعة حيث مكشوفة كيماوية باستخدام مبيد (ميثا تومب بمعدل 4.5 لتر/هكتار) بعد الزراعة وقبل الري второй أيضاً حققت أعلى متوسطات قيم لصفات الدراسة مثبِّتاً باستخدام مبيد الحشائش بعد الزراعة وقبل الري مقارنة بأيضاً مكشوفات كيماوية، حيث أن استخدام مبيد (ميثا تومب بمعدل 4.5 لتر/هكتار) بعد الزراعة وقبل الابتقال + الزيقق مرة واحدة قبل الري الثانية أو استخدام مبيد الحشائش فقط مع التسميد بمعدل 50% من السماد المعدني + 50% من سماد النانو سجل أعلى متوسطات قيم مقارنة بمعاملات التسميد الأخرى خلال موسمى الزراعة.
Assessment of Sorghum (Sorghum bicolor L.) Productivity under Different Weed Control Methods

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- As the weed control methods had an effect on the productivity of sorghum, the number of plants per square meter and the height of the sorghum plant increased. Where the best method was one-time irrigation followed by spraying with herbicides compared to other treatments, the irrigation method had the lowest efficiency in reducing the number and weight of the sorghum. In contrast, fertilizer at 50% of the metallic fertilizer + 50% of the nano fertilizer recorded the lowest average values of the sorghum productivity and reduced competition between the sorghum and the sorghum. The recommendations: From the results obtained, it was found that to increase the yield and quality of the low-yielding sorghum grown under Alexandria conditions or similar areas, it is possible to use the weed control method (one-time irrigation + spraying with herbicides before emergence) with metallic fertilizer at 50% of the recommended dose + 50% of the nano fertilizer where this treatment worked on increasing the yield and reducing the growth and competition of weeds for the sorghum yield.