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المجلة العراقية لبحوث السوق وحماية المستهلك

INFLUENCE OF FIELD DISTRIBUTION OF FLAX, JOHNSON GRASS EXTRACT, AND QUIZALOFOP-P-TEFURYL ON WEED ACCOMPANYING AND SOME GROWTH INDICATORS

***Rasol Hassan Nemr* [1] , *Watheq Falhi Hammood*[2]**
[1]Researcher, Department of Field Crops, College of Agricultural Engineering Sciences, University of Baghdad, Baghdad, Iraq. Rassoul.hasan1206a@coagri.uobaghdad.edu.iq
[2] Assistant Professor PhD., Department of Field Crops, College of Agricultural Engineering Sciences, University of Baghdad, Baghdad, Iraq. drwatheqfalhi@gmail.com

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ABSTRACT

A field experiment was carried out during the winter season for the year 2021-2022 at the Agricultural Research Station A of the Field Crops Department - College of Agricultural Engineering Sciences- University of Baghdad/ Al-Jadriya. To determine which of the plant densities has the most influence on the weeds associated with the flax crop (Syrian local variety). And to determine the best effect of the Johnson grass (*sorghum halepance* L.) weed extract, whether alone or in combination with the used Quizalofop- p- Tefuryl herbicide, and to use it in integratTed weed control programs to reduce dependence on herbicides in weed control, Reduce environmental pollution by these herbicides, According to the design of the Randomized Complete Block Design (RCBD). In the order of split plot and with three replications, Such as the first factor, the distance between the row (20, 25, and 30) cm that represents the main plots. Then, the second factor is Control treatments which represent the subplots, (weed free (T1), application Quizalofop-p-Tefuryl at a rate of 2 mL commercial substance (T2), Recommended application rate, Johnson grass extract (stem and leaves) at a rate of 18 L (T3), half the amount of herbicide + half the amount of extract (T4), weedy (T5)).

The results showed the following:

The distance of 20 cm achieved the lowest dry weight of the weed and the highest average inhibition of 134.57 g/m^2 and 49.91%, respectively. While the distance of 30 cm achieved the highest plant height of 78.63 cm, the highest number of main branches in the plant amounted to 5.162 branch/ plant. The highest weight Dry flax plants amounted to 355.21 g/m^2. Moreover, the highest percentage of oil was 38.524%.

The treatment (T2) achieved the lowest dry weight of the weed and the highest percentage of inhibition amounting to 138.87 g/m^2 and 49.91%, respectively. The highest plant height reached 76.92 cm, the highest number of main branches in the plant amounted to 5.158 branch/ plant, and the highest dry weight of flax plants reached 5.158 branch/ plant. 398.61 g/m^2 and the highest percentage of oil was 37.35%.

The effect of the interaction between the two study factors was significant in most of the traits under study. As the distance of 20 cm with the T2 treatment achieved the lowest dry weight of the weed amounted to 124.53 g/m^2 and the highest inhibition rate of 52.35%. While the interaction between the distance of 30 cm and T2 achieved the highest plant height of 80.04 cm, the highest average number of main branches reached 5.833 branch/ plant, and the highest dry weight of flax plants reached 398.61 g/m^2 and achieved the highest percentage of oil amounted to 39.847%.

Keywords: Flax, Johnson grass weed extract, Quizalofop-p-Tefuryl, Allelopathy.

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تأثير التوزيع الحقلي للكتان ومستخلص السفرندا ومبيد Quizalofop-p-Tefuryl في الادغال المرافقة له وبعض مؤشرات النمو

رسول حسن نمر[1] ، *واثق فلحي حمود*[2]

[1] باحث، قسم المحاصيل الحقلية، كلية علوم الهندسة الزراعية، جامعة بغداد، بغداد، العراق Rassoul.hasan1206a@coagri.uobaghdad.edu.iq

[2] استاذ مساعد، دكتور، قسم المحاصيل الحقلية، كلية علوم الهندسة الزراعية، جامعة بغداد، بغداد، العراق drwatheqfalhi@gmail.com

الخلاصة

نفذت تجربة حقلية في الموسم الشتوي لسنة 2021-2022 في محطة الابحاث الزراعية A التابعة لقسم المحاصيل الحقيلة، كلية علوم الهندسة الزراعية، جامعة بغداد / الجادرية، بهدف تحديد اي من الكثافات النباتية أكثر تأثيرا في الادغال المرافقة لمحصول الكتان الصنف (سوري محلي)، وتحديد افضل تأثير للمستخلص النباتي لدغل السفرندا سواء لوحده او بالتكامل مع مبيد Quizalofop-p-Tefuryl المستعمل، والاستفادة منها في برامج المكافحة المتكاملة للأدغال لتقليل الاعتماد على المبيدات في مكافحة الادغال وزيادة الحاصل وتقليل التلوث البيئي بفعل هذ المبيد وعلى وفق تصميم القطاعات الكاملة المعشاة RCBD بترتيب الألواح المنشقة وبثلاث مكررات، مثل العامل الاول المسافة بين الخطوط (20 و25 و30) سم الالواح الرئيسة تمثل الالواح الثانوية معاملات المكافحة،(معاملة غياب الأدغال (T1)، رش مبيد Quizalofop-p-Tefuryl بمعدل 2 مل/لتر مادة تجارية (T2)، معدل الرش الموصى به، مستخلص نباتات السفرندا (الساق والاوراق) بمعدل 18 لتر/هـ (T3)، نصف كمية المبيد + نصف كمية المستخلص(T4)، المعاملة المدغلة (T5)). بينت النتائج ما يلي:

حققت المسافة 20 سم اقل وزن جاف للأدغال واعلى متوسط للتثبيط بلغا 134.57 غم/م^2 و 49.91 % على التوالي بينما حققت المسافة 30 سم اعلى ارتفاع للنبات بلغ 78.63 سم، واعلى عدد للأفرع الرئيسة في النبات بلغت 5.162 فرع/نبات، واعلى وزن جاف لنباتات الكتان بلغ 355.21 غم/م^2، واعلى نسبة مئوية للزيت بلغت 38.524%.

حققت المعاملة (T2) اقل وزن جاف للأدغال واعلى نسبة مئوية للتثبيط بلغا 138.87 غم/م^2 و 49.91 % بالتتابع، واعلى ارتفاع للنبات بلغ 76.92 سم، واعلى عدد للأفرع الرئيسة في النبات بلغ 5.158 فرع/نبات، واعلى وزن جاف لنباتات الكتان بلغ 398.61 غم/م^2، واعلى نسبة مئوية للزيت بلغت 37.35 % .

كان تأثير التداخل بين عاملي الدراسة معنويا في أغلب الصفات قيد الدراسة اذ حققت المسافة 20 سم مع المعاملة T2 اقل وزن جاف للأدغال بلغ 124.53 غم/م^2 واعلى نسبة تثبيط 52.35 %، بينما حقق التداخل بين المسافة 30 سم و T2 اعلى ارتفاع للنبات بلغ 80.04 سم، واعلى متوسط لعدد الافرع الرئيسة بلغ 5.833 فرع/نبات، واعلى وزن جاف لنباتات الكتان بلغ 398.61 غم/م^2، وحقق اعلى نسبة مئوية للزيت بلغت 39.847%.

الكلمات المفتاحية: الكتان، مستخلص دغل السفرندا، Quizalofop-p-Tefuryl، الجهد الاليلوباثي.

INTRODUCTION

The flax plant (*Linum usitatissimum* L.) is one of the winter crops and the flax family (Linaceae). It is grown in different parts of the world to obtain oil and fiber. **FAO (2019)** estimated the area cultivated with flax to be about 264028 hectares, and the productivity reached about 1092234.03 tons.

The groups of noxious weeds that tolerate weed herbicides and resistant biotypes have become the main problem in agriculture, as their number has reached 515 species, of which 268 are dicotyledonous and 247 are monocotyledonous. Many species have developed resistance to more than one site targeted by herbicides **(Satorre *et al*., 2020)**. The improper modification of herbicides contributed to the application of plant species application in the fields, and the use of herbicides for several years on the same crop and the same field caused the accumulation of herbicides in the soil, thus accelerating the development of resistant biotypes. The development of herbicide-resistant weeds requires new solutions to deal with the problem because the economic losses from weeds, Can be higher than those caused by other pests, including insects and diseases.

Attention must be focused at present on reducing dependence on the use of chemical herbicides by finding alternative technologies for weed management, which fall within the concept of Integrated Weed Management, as Integrated Weed Management programs (IWM) are provided to farmers to help guide them in choosing the best science-based practices. Crop protection and weed control supervision. These programs are designed as agricultural solutions dedicated to taking a comprehensive approach to weed management through various techniques Such as agricultural rotation, and increasing the number of crop plants per unit area leads to an increase in the crop canopy’s efficiency in intercepting light and shading crop plants for weeds, thus reducing their numbers and inhibiting their dry weights as well It is a means of increasing productivity per unit area **(Al-Chalabi & Hammood, 2016)**. In addition, the use of multiple traditional and mechanical work methods such as weed control. Incorporating a range of weed management measures helps maintain weed control systems over time and preserves the farmer's ability to provide productive crops while protecting the soil **(Bayer Crop Science, 2009)**.

Among the safe strategies proposed in controlling the effects of weeds is the use of the allelopathic phenomenon of some plants such as white corn Sorghum in reducing the effect of weeds. And many types of research have been conducted in the world on the introduction of the allelopathy phenomenon in weed control programs and showed important results in reducing the density and dry weight of weeds **(Safi *et al*., 2020; Ali, 2020)**. Which was positively reflected in increasing crop yield. Although the use of the allelopathic phenomenon in weed control does not reach the high efficiency of chemical herbicides manufactured for the control and selection process against weed plants **(Cheema *et al*., 2013)**. Therefore, additional work is required to increase the efficiency of this phenomenon in weed control and improve crop productivity.

This study aimed to determine which of the distances between the rows is more effective in weeds associated with the flax crop and to determine the best effect of Johnson grass weed extract, whether alone or in combination with the used Quizalofop-p-Tefuryl herbicide, and use them in integrated weed control programs to reduce dependence on herbicides in crops. Improving the growth characteristics of the crop and reducing environmental pollution due to these herbicides.

MATERIALS AND METHODS

A field experiment was carried out during the winter season of 2021-2022 at the research station of the Field Crops Department - College of Agricultural Engineering Sciences - University of Baghdad / Al-Jadriya, which study the effect of some integrated control elements on the weeds associated with the flax crop. The experiment was carried out with a split-plot arrangement according to the randomized complete block design (RCBD) and with three replications. The main plots included three distances between the row (20, 25, and 30 cm), while the sub-plots included:

1. Weed free treatment
2. Application Quizalofop-p-Tefuryl at a rate of 2 mL/L commercial material, the Recommended spray rate.
3. Johnson grass extract (stem and leaves) at a rate of 18 L. (In addition, Application at the same time as the herbicide).
4. Half the amount of the herbicide + half the amount of the extract.
5. Weedy treatment.

The process of application the herbicide and the extract application in the early morning on 13/1/2022 using a knapsack sprinkler with a capacity of 16 L application the herbicide until the leaves completely wet. The ratio of the herbicide was 2 mL/L, while the extract was prepared from the Johnson grass plant, as several plants were collected in the field. In laboratories of the Ministry of Science and Technology, Ultrasonic Extraction of Phenolic Compounds the phenolic compounds was extracted from a homogenized plant sample (3 g) using ethanol/water (70/30) solvent. The extraction process was carried out using Ultrasonic Bath (USA) at room temperature for 1 h. After filtration, 5 mL of liquid extract was used for extraction yield determination. The solvent was removed by a rotary evaporator under vacuum (Slovenia) and was dried at 40°C to the constant mass. Dry extracts were stored in glass bottles at 4°C to prevent oxidative damage until analysis. Quantification of individual phenolic compounds was performed by reversed-phase HPLC analysis, using an SYKAMN HPLC chromatographic system equipped with a UV detector), Chemstation, and a Zorbax Eclipse Plus-C18-OSD .25 cm, 4.6 mm column. The column temperature was 30ºC the gradient elution method, with eluent A (methanol) and eluent B (1% formic acid in water (v/v)) was performed, as follows: initial 0-4 min, 40 % B; 4-10 min, 50 % B. and flow rate of 0.7 mL/min. The injected volume of samples was 100 µL .and the standard was 100 µL and it was done automatically using an autosampler. The spectra were acquired in the 280 nm **(Radovanović *et al*., 2015)**.

Table (1): Analysis of phenolic substances from Johnson grass extract, laboratories of the Ministry of Science and Technology.

No	Name	Con (µg / g)
1	Gallic acid	10.56
2	Hydroxybanzaoic acid	35.69
3	Vanillic acid	18.79
4	Caffeic acid	24.98
5	p-Coumaric acid	18.25
6	Ferulic acid	17.99

Soil service operations were carried out such as tillage, smoothing, and leveling, then the experimental land was divided into 45 experimental units, and the area of one experimental unit was 2.25 m^2 (1.5 meters long × 1.5 meters wide). Fertilizers were added according to the recommended quantities, with an average of 150 kgN/ha **(Al-Rawi & Noaman, 2020)** in two intervals, the first at germination and the second at flowering. Flax seeds of the local Syrian variety, row were sown on 11/29/2021, and the weight of the sown seeds for each experimental unit was 9 g. On the number of coefficients of planting distance 20, 25, and 30 cm between the row, respectively. Crop irrigation was carried out as often as needed, and plants were harvested when signs of maturity appeared for each experimental unit.

Characteristic under study

The weeds associated with the flax crop, including

1. Dry weight of the weed (g/m^2) at harvest: The weed was cut at the soil surface level from an area of 1 m^2. They were randomly placed in perforated bags and then dried in the sun until the weight stabilized **(Al-Chalabi, 1988)**.

2. Percentage of inhibition in the dry weight of the weeds: The percentage of inhibition was calculated in the dry weight of the weeds for the treatments different according to the following equation.

$$\text{Inhibition percentage } (\%) = 100 - \frac{A}{B} \times 100$$

As A = dry weight of weeds in weed control treatments.
B = dry weight of the weed in the weedy treatment.

The characteristics of growth, including

1. Plant height (cm): Measure the average height of the main stem from the soil surface to the apex of the main stem at a staged harvest of ten plants randomly taken from the mid row of each experimental unit.
2. The number of main branches in the plant (branch/ plant): according to the average number of the main side branches of the plant ten plants was randomly selected from the mean row of each experimental unit.
3. Dry weight of flax plants (g/m^2): It was calculated as an average of a whole line taken at the end of the capsule filling stage when it reached full maturity, then weighed.

Oil percentage in seeds: Oil percentage was estimated in the central laboratory for ostgraduate studies - College of Engineering Sciences Agriculture - the University of Baghdad, where the oil was extracted from flax seeds using the Soxhlet device **(A.O.A.C, 1990)**.

Its percentage was estimated according to the following equation:

$$\text{Oil percentage in seeds } (\%) = \left(\frac{\text{weight of oil extracted from the sample}}{dry\ weight\ of\ the\ sample}\right) \times 100$$

Statistical analysis

The data were collected and tabulated for the characteristics under study, then analyzed statistically according to the arrangement of split plots by randomized complete block design (RCBD) using the GENSTAT4 program, and the arithmetic means of the coefficients were compared using the least significant difference (L.S.D) with a probability level of 0.05 **(Steel & Torrie, 1980)**.

RESULTS AND DISCUSSION

Effect of different treatments on companion weed of flax crop Weed types:

When diagnosing the types of weeds accompanying the flax crop in the treatments in which the weeds were left without control, it was found that many types of weeds application, as shown in (Table 2).

Table (2): Types of weeds in the experiment site for the fall season 2021-2022.

No	Local name	The scientific name	Family name	Leaves type	Life cycle
1	White goosefoot	*Chenopodium album* L.	Chenopodiaceae	Broad leaf	Annual
2	London Rocket	*Sisymbrium irio* L.	Cruciferae	Broad leaf	Annual
3	Prickly lettuce	*Lactuca serriola* L.	Compositeae	Broad leaf	Annual
4	Button weed	*Malva parviflora* L.	Malvaceae	Broad leaf	Annual

5	Milk thistle	*Silybum marianum* L.	Campositeae	Broad leaf	Annual
6	Sweet clover	*Melilotus indicus* L.	Fabaceae	Broad leaf	Annual
7	Wild beets	*Beta vulgaris* L.	Chenopodiaceae	Broad leaf	Annual
8	cancer weed	*Eupharbia peplums* L.	Eupharbiaceae	Broad leaf	Annual
9	wild carrot	*Daucus carota* L.	Umbelifereae	Broad leaf	Annual
10	small canary grass	*Pharlaris minor* L.	Poaceae	Narrow leaf	Annual
11	sun spurge	*Euphorbia helioscopia* L.	Eupharbiaceae	Broad leaf	Annual
12	Knotgrass	*Polygoumum* L. *aviculare*	Plantaginaceae	Broad leaf	Annual
13	beard-grass	*monpeliensis* L. *Polygonum*	Poaceae	Narrow leaf	Annual
14	darnel ryegrass	*Lolium temulentum* L.	Poaceae	Narrow leaf	Annual
15	Datura	*Datura Stramonium* L.	Solanaceae	Broad leaf	Annual
16	Wild safflower	*oxyacanthus* L. *Carthamus*	safflower Wild	Broad leaf	Annual
17	Scarlet pimpernel	*Anagalli arvensis* L.	Primulaceae	Broad leaf	Annual
18	Smeller Bind Weed	*Convolvulus arvensis* L.	Convolvulaceae	Broad leaf	Annual
19	Platain	*Plantago lanceolate* L.	Plantaginaceae	Broad leaf	Annual
20	milky tassel	*Sonchus oleraceus* L.	Compositeae	Broad leaf	Annual
21	johnson grass	*Sorghum halepense* L.	Poaceae	Narrow leaf	Annual

The dry weight of the weeds g/m2 and the percentage of inhibition % in the dry weight of the weeds

The results in (Table 3) indicate that there is a significant effect of the distance between the row and the weed control treatments and the interaction between them on the dry weight of the weeds. As the distance of 20 cm gave, the least dry weight of the weeds amounted to 134.57 g/m^2, and the highest percentage of inhibition amounted to 49.57% and differed significantly from the rest of the treatments. While the distance of 30 cm was recorded, the highest dry weight of the weed amounted to 157.09 g/m^2, and the lowest percentage of inhibition amounted to 45.75%.

T2 treatment gave the lowest dry weight of weeds amounting to 138.87 g/m^2, and the highest percentage of inhibition amounted to 49.91%. This may be attributed to the action of the herbicide by reducing their dry weights and differed significantly from the rest of the treatments. In addition, the treatments T3 and T4 gave dry weights of weed plants amounted to (156.53 and 159.59) g/m^2, respectively. Moreover, the percentage of inhibition amounted to (44.15 and 42.98) %, respectively. The reason may be due to the action of the herbicide or the phenolic substances that are found in the Johnson grass extract (Table 1). As they work to prevent cell division and elongation, the absorption of water and nutrients, protein synthesis, and metabolism, and the activity of antioxidant enzymes **(Cheng & Cheng, 2015)**. as well as the presence of the Sorgoleone compound, Which works to inhibit the process of photosynthesis, the second system, the transfer of electrons in the mitochondria, the root H+-ATPase, and the absorption of water **(Dayan *et al*., 2010)**. The T5 treatment recorded the highest dry weight of the weed, which reached 279.71 g/m^2, and the lowest percentage of inhibition was 0.00%.

The interaction between the distance of 20 cm and the control treatment T2 achieved the lowest dry weight of the weed amounted to 124.53 g/m^2 and the highest percentage of inhibition was 52.35 %, it may be attributed to the reason for the nature of the systemic action of the herbicide and its effect on the weed plants, both annual and biennial, through the gathering in the growth sites of buds, roots, and disruptions in cell functions. While the interaction between the distance of 20 cm and the two treatments T3 and T4 was recorded as (135.97 and 143.47 g/m^2) and the percentage of inhibition amounted to (49.44 and 46.97 %), respectively. The reason may be due to the nature of the action of the herbicide or the phenolic acids that It is present in Johnson grass extract (Table 1) as it inhibits cell division and elongation, respiration and photosynthesis, water and nutrient absorption, protein synthesis, and metabolism, antioxidant enzyme activity, etc. **(Cheng & Cheng, 2015)**. While the interaction between the distance 30 cm, and the treatment T5 weedy recorded highest dry weight of the weeds reaching 290.27 g/m^2, and the lowest percentage of inhibition was 0.00 %.

Effect of different treatments on some vegetative growth characteristics of flax plants

Plant height (cm)

The results in (Table 3) indicate that there is a significant effect of the distance between the row and the control treatments and the interaction between them on the height of the plants, as the distance of 30 cm achieved the highest plant height of 78.63 cm, For the rest of the treatments, the 20 cm treatment recorded the lowest plant height of 69.09 cm. The reason for the low plant height in the weedy treatment may be due to the competition between weeds and crop plants with each other because of the high density of nutrients in the soil as well as their secretion of allelopathic substances, which contributed to weakening Crop growth, including plant height.

The herbicide treatment T2 achieved a high plant height of 76.92 cm, and it differed significantly from the rest of the treatments T4, and T3, which gave heights of (73.82 and 71.54) cm, respectively. Competition between weeds and crops due to the systemic nature of the herbicide and its effect on narrow-leafed weeds, which allowed the plant to obtain good environmental resources such as water, light, nutrients, etc... Or perhaps because of the allelopathic substances (phenols and Sorgoleone) and their inhibitory effect on many physiological processes such as Photosynthesis, the second system, electron transport in mitochondria, respiration, absorption of water and elements, oxidative enzymes, etc. **(Dayan *et al*., 2010; Cheng & Cheng, 2015)**. Compared to the T5 control treatment, which gave the lowest average plant height Measured at 65.46 cm.

The interaction between the distance of 30 cm and weed free treatment (T1) achieved the highest average of the characteristic, which reached 88.68 cm. As well as the interaction between the treatment T2 and the distance of 30 cm, the average height of the plant was 80.04 cm due to the nature of the action of the systemic herbicide in affecting high-leaved plants, through the accumulation in meristematic tissues and roots and causing disruption in cell functions. While the interaction between the two treatments T3 and T4 and the distance of 30 cm averaged for the mentioned characteristic amounted to (77.79 and 77.55) cm, respectively.

Photosynthesis, respiration, the activity of oxidative enzymes, and protein synthesis through the effect on DNA and RNA upon replication, as Ferulic acid and cinnamic acid act as phenols and alkaloids in inhibiting protein synthesis **(Li *et al.* 2010; Cheng & Cheng, 2015)**. Compared with the interaction between the distance of 20 cm and the treatment The T5 weedy, which gave the lowest average, was 63.17 cm.

A number of main branches branch/plant

The results in (Table 3) indicate that there is a significant effect of the treatment of the distance between the row and the control treatments and the interaction between them on the number of main branches in the plant. As the distance of 30 cm achieved, the highest mean of 5.16 branch/plant, and it differed significantly from the rest of the treatments, and the distance of 20 cm recorded the lowest number of branches, reaching 4.12 branch/plant. Plants, which encouraged the growth of buds that develop into main branches that grow from the first node on the main stem at the soil surface **(Mohammed *et al.*, 2020)**, and this treatment achieved the highest height for crop plants (Table 3).

The weed free treatment (T1) gave the highest mean of 6.35 branch/plant, which may be due to the lack of competition between plants and the total absence of weeds, which contributed to providing a suitable environment for increasing plant branching. The reason is the nature of the action of the herbicide in reducing the dry weight of the weeds and increasing the percentage of inhibition in their dry weights (Table 3). The two treatments T4 and T3 gave averages of (4.90 and 3.98) for branch/plant, respectively. The reason may be due to the action of the extract or the herbicide or both in reducing the dry weight of the weeds and increasing the percentage of inhibition in their dry weights (Table 3) and reducing the competition between crop plants for environmental resources. T5 treatment gave the lowest average of 2.96 branch/plant.

The interaction was significant between the distance of 30 cm and weed free treatment (T1), as it achieved the highest number of main branches of 6.55 branch/plant, and the distance between 30 and treatment T2 gave 5.83 branch/plant. In the growth sites of meristematic tissue, buds, roots, and disruption in cell functions, as well as the interaction between the distance of 30 cm and the two treatments T3 and T4 gave an average of (5.77 and 4.43) branch/plant. And the interaction between the distance of 20 cm and treatment T5, which recorded the lowest average 2.55 branch/plant.

The dry weight of flax plants g/m^2

The results in (Table 3) indicate that there is a significant effect of the distance between the row and the control treatments and the interaction between them in dry weight of flax plants g/m^2. The distance of 30 cm gave the highest dry weight of 355.21 g/m^2, The reason may be due to the lack of competition between crop plants as well as the area per plant compared to the rest of the treatments, because of the increase in plant height and the increase in the main branches, the value of the dry weight of flax plants increased according to (Table 3), and it differed significantly from the rest of the treatments, and the distance of 20 cm gave the lowest mean of 248.37 g/m^2.

The weed free treatment (T1) gave the highest average of 438.98 g/m^2, and it differed significantly from the rest of the treatments. The T2 treatment recorded an average of 333.11 g/m^2. The reason may be due to the systemic nature of the herbicide and its effect on narrow leaved plants, which contributed to maintaining growth requirements for the benefit of crop plants. In addition, this treatment recorded high averages in plant height and the number of main branches (Table 3). While treatments T4 and T3 gave averages for the trait the aforementioned amounts were (272.50 and 246.74) g/m^2, respectively, perhaps due to allelopathic substances (phenols and Sorgoleone) and their inhibitory effect on many physiological processes, photosynthesis, system II, electron transport in mitochondria, respiration, absorption of water and elements, oxidative enzymes, etc. **(Dayan *et al*., 2010 ; Cheng & Cheng, 2015)** achieving a high percentage of inhibition in the dry weight of the weed (Table 3). Thus, it reduced the competition between the crop and the weed, and the cultivated treatment T5 recorded the lowest average of 190.4 g/m^2.

The interaction between the two treatments of the distance of 30 cm and the control treatment weed free treatment (T1) achieved the highest average for the characteristic amounted to 485.74 g/m^2 due to the height of the plant and the increase in branching (Table 3), which increased the dry weight value. While the interaction between the treatment T2 and the distance 30 cm gave an average dry weight of 398.61 g/m^2, because of the nature of the herbicide in the thin weeds and annuals and the decrease in their dry weights (Table 3). Both the treatments T3 and T4 and the distance of 30 cm gave averages of (355.87 and 316.69) g/m^2, respectively. Due to the effect of allelopathic substances in the extract, because of the effect of the herbicide, or both and their effect On cell division, biosynthesis of hormones, and absorption of elements **(Cheng & Cheng, 2015)**. The distance of 20 cm and 5T recorded the lowest average of 162.14 g/m^2.

Table (3): Effect of different treatments on weed traits and some flax plant traits.

Characteristic / Treatments		**Dry weight for weeds**	**%for inhibition in weeds Dry weight**	**Plant height**	**Number of branches**	**The dry weight of flax plant**	**Percentage of oil in seeds**
Distance between the row	20	134.57	49.75	69.09	4.12	248.37	34.59
	25	149.2	46.72	75.16	4.72	285.45	37.66
	30	157.1	45.75	78.63	5.16	355.21	38.52
LSD 0.05		5.76	1.02	1.42	0.41	6.59	0.457
Treatments control	T1	0.00	100.00	83.73	6.35	438.98	38.44
	T2	138.87	49.91	76.92	5.15	333.11	37.35
	T3	156.53	44.15	73.82	4.9	272.50	36.47
	T4	159.59	42.98	71.54	3.98	246.74	36.49
	T5	279.71	0.00	65.46	2.96	190.40	35.87
LSD 0.05		3.3	0.99	1.42	0.30	4.31	0.29
cm20	T1	0.00	100.00	75.92	6.11	383.80	36.53
	T2	124.53	52.35	72.09	4.22	287.83	34.59
	T3	135.97	49.44	68.75	4.22	213.67	34.35
	T4	143.47	46.97	65.55	3.54	194.44	34.37
	T5	268.87	0.00	63.17	2.55	162.14	33.1
cm25	T1	0.00	100.00	86.58	4.22	447.39	38.4
	T2	139.3	50.24	78.63	5.42	312.88	37.62
	T3	162.6	41.93	74.92	4.72	247.95	37.53
	T4	163.9	41.44	71.58	3.99	229.09	37.56
	T5	0.0028	0.00	64.1	3.11	189.93	37.21
cm30	T1	0.00	100.00	88.68	6.55	485.74	40.39
	T2	152.8	47.13	80.04	5.83	398.61	39.84
	T3	171	41.07	77.79	5.77	355.87	37.53
	T4	171.4	40.53	77.5	4.43	316.69	37.54
	T5	290.3	0.00	69.13	3.22	219.13	37.3
LSD 0.05		6.81	1.69	2.43	0.56	8.36	0.57

T1- weed-free treatment.

T2- Treatment of the herbicide Quizalofop-p-Tefury1 at a rate of 2 mL/ L of commercial material.
T3- Treatment of Johnson grass extract at a rate of 18 L.
T4- Quizalofop-p-Tefuryl at a rate of 1 mL/L + Johnson grass extract at a rate of 9 L.
T5 - weedy treatment.

The effect of different treatments on the qualitative characteristics of seeds
Percentage of oil in the seeds (%)

The results in (Table 3) indicate that there is a significant effect of the distance between the row and the control treatments and the interaction between them on the percentage of oil in the seeds. The distance of 30 cm gave the highest percentage of oil amounting to 38.524 %. The positive effect of this is stimulating the enzymes responsible for the biochemical processes within the plant such as Acetyl CoA Carboxylase and Fatty acid Synthetase necessary for the synthesis of fatty acids and others, as well as enzyme conjugates such as Acetyl Co, which is the basis for the synthesis of fatty acids, which will be positively reflected in the activation of the metabolic pathways responsible for the synthesis vital oil **(Al-Ani, 2022)**. However, the distance of 20 cm gave the lowest average of 34.59 %.

The weed free treatment (T1) had the highest average of 38.443 %, and it differed significantly from the rest of the treatments. As for the treatment T2, it achieved an average of 37.356 %. The reason may be due to the nature of the action of the systemic herbicide and its effect on the annual and biennial leaved plants by reducing their dry weights and increasing the inhibition rate (Table 3). Thus, the crop plants get an environment with few weeds and competition. As for the treatments, T3 and T4 achieved averages of (36.47 and 36.49) %, respectively. Cells and their elongation and inhibition of the process of photosynthesis and respiration **(Cheng & Cheng, 2015)**, and the weedy treatment T5 recorded the lowest average of 35.871%.

The interaction between the two treatments of the distance of 30 cm and the weed free treatment (T1) was the highest average of 40.39 %, while the interaction between the distance of 30 cm and T2 achieved an average of 39.847%. The area of one plant compared to the rest of the treatments. As for the interactions between the distance of 30 cm and the two treatments T3 and T4, they achieved two averages of (37.53 and 37.54) %, respectively. The reason may be due to the nature of the action of the herbicide or extract due to the presence of allelopathic materials or the interaction between them, which contributed to reducing the dry weight of the weeds and increasing the inhibition rate (Table 3). Alternatively, this may be due to the large area per plant compared to the distance of 20 cm and the weed treatment 5T, as it gave the lowest average of 33.1%.

CONCLUSION

Planting with a little spacing between the rows achieved the highest results in the dry weight of the weeds, the percentage of inhibition in the dry weight of the weeds, and the percentage of oil in the seeds. Quizalofop-p-Tefuryl application treatment achieved the best averages in all characteristics, followed by the treatment of Johnson grass extract. The interaction between little spacing rows with the herbicide achieved the best values for most of the traits. Complementarity between the herbicide and extract affects the flax crop's weeds and improves its characteristics and components.

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