Nat. Volatiles & Essent. Oils, 2021; 8(6): 1833-1842

NVEO
Natural Volatiles &
Essential Oils

Response Of Triticum Aestivum L. To Spraying With Sorghum Extract At Different Spray Times And Its Relationship To Growth, Yield And Weeds Growth

Khitam Mohsin Hannoon and Ali Farhoud Nasir

Crops Department, College of Agriculture, University of Basra, Iraq

Abstract

Field experiment wene condueted at pruviane of basra to study the effect of sorghum extract with the herbicide (Atlantis) in controll wheat weeds and the effect of the spraying period of these extracts on weeds growth yied of wheat. The experiment was carried out according to a split plot within a randomized complete block design (RCBD) with three replications. The main plots included three spraying periods, which are (T1 before Tillering, T2 when Tillering, and T3 when elongating) and the secondary plots included five control treatments (C1 Atlantis herbicide, C2 check, C3 sorghum extract + half the recommended amount, C4 sorghum extract, C5 sorghum extract + full concentration of the pesticide) and the following characteristics were studied: Dry weight of broad-leaved weeds , plant height, spike length, grain yield and bio yield. The use of sorghum extract + full concentration of the herbicide led to significant increases in most of the studied traits, and this treatment did not differ significantly from the treatment of sorghum extract + half the amount of herbicide, where it outperformed. As decreasing the dry weight of broad-leaved weeds , it gave the lowest dry weight and the highest average in plant height, spike length, grain yield and biological yield. The results showed that the second spraying period was significantly superior in all studied traits. The interaction between the two factors of the study (C5×T2) sorghum extract + full concentration of the pesticide with the second spraying period, which did not differ significantly from the treatment of sorghum extract + half the concentration of the pesticide with the second spraying period, was superior in most of the studied traits, as it gave the lowest average for the weeds Broad-leaved (3.97) g m2 and the highest average in plant height (93.52) cm, grain yield (6.257) and vital yield (16.940).

Keywords: Allelopathic, plant extracts, weeds

The introduction

The weeds is one of the most important obstacles to agricultural production, as it leads to a reduction in yield and a significant reduce in quality, which causes losses in production.

In the fight against the weeds, humans have followed multiple methods to get rid of these plants and reduce their competition. Chemical control using herbicide is one of the most widely used and common methods in recent decades, and its use has been highly concentrated, which was accompanied by the emergence of many environmental problems as a result of the excessive use of these chemicals on health and the environment, so There was an urgent need to find alternatives to these chemicals or to reduce their use mainly, and one of these modern methods is the tendency to benefit from the allelopathic phenomenon (Rice, 2012).

Studies indicate the possibility of using extracts of some plants, whether they are weeds or agricultural crops, for their use of active substances that affect the growth of the accompanying weeds , as is the case in the use of sorghum crop extract for its ability to control the growth of the weeds , as indicated by the studies implemented in this aspect, including the study (Khan , 2015) about the use of allelopathic extracts for the leaves of many plants, including sorghum extract, to significantly reduce the growth of the weeds associated with wheat, as well as what was mentioned (Mahlat, 2019) about the effect of different concentrations of sorghum extracts on reducing the germination rate of weeds seeds compared to the control treatment. As well as the studies of (Mahmood et al. 2013), which emphasized improving the growth and yield of wheat and reducing the impact of the weeds on it as a result of using sorghum extract (Borrs et al. 2004) (lqbal et al. 2010) (Khan et al. 2016), where the leaf area of the flag leaf of wheat increased, the number of spikes per square meter, and the total grain yield. And the biological yield, which confirms the effectiveness of the sorghum extract in fighting the weeds, especially with a mixture of one of the pesticides such as the Atlantis pesticide. The treatment is the most effective in reducing the weight of dry weeds and increasing the growth and yield of wheat.

Materials and methods

An experiment was carried out in the north of Basra governorate, during the agricultural season 2021-2020 affiliated to the College of Agriculture / University of Basra, to find out the effect of sorghum plant extract and the time of spraying on the growth and yield of wheat and the accompanying weeds. Random samples of soil at a depth of 0-30 cm from different places of the field for the purpose of knowing the chemical and physical properties. and analyzed in the central laboratory of the Faculty of Agriculture, University of Basra, and the results are summarized in Table (1).

Table (1) The chemical and physical properties of the soil of the experimental field 2020-2021

Adjective		Value	Unit
PH		7.4	-------
E.C.		4.11	dSm-1
Ready-made Nitrogen		37.00	Mg Kg-1 soil
Ready-made Phosphorous		12.75	
Soil Separators	The sand	67	gm Km-1 soil
	Silt	590	

	Mud	**340**	
Positive ions dissolved	**Ca++**	**1.21**	**Mg/g**
	Mg++	**0.622**	
	Na++	**1.28**	
	K+	**0.36**	
Negative ions dissolved	**-Cl**	**1.77**	
	-SO4	**1.17**	
	-HCO3	**0.488**	
Soil texture	**Alluvial clay mixture**		

Preparation of the aqueous extract of the sorghum plant for spraying.

The leaves and stems (the vegetative part) of the sorghum plant were collected from the agricultural fields after they were brought to the laboratory. They were washed with distilled water to clean it of dust and impurities. Then they were cut into small parts by a sharp knife with several tools. The small vegetative parts were placed in an electric mixer with the addition of distilled water to it at a ratio of 3- 1 liter per 100 g of the plant, after mixing it well, it is left in the mixer for a short period to precipitate the impurities at the bottom of the mixer. Then put the extract in a beaker in a refrigerator until use, This method is called the cold water extraction method, and the extract has a high concentration on the weeeds growing between the cultivated wheat lines, and its effectiveness is compared with the control treatments, as well as with the treatments of the herbicide used.

Agricultural Operations

If the land was plowed with two orthogonal plows, it was smoothed and then leveled by a leveling machine, and the experimental land was divided into experimental units with an area of 3 x 5.2) m2 and the distance between the experimental units was 1 m. Repeated and last 2 m on lines at a seeding rate of 120 kg/ h-1 per line, irrigate the experimental field whenever needed, phosphate fertilizer before planting and then with urea fertilizer (46% nitrogen) as a source of nitrogen and added doses in two batches, the first dose after seedling emergence and the second in the elongation stage (Jdoua, 2003). Then the cultivation of wheat, variety 22 research, and it was sourced from the Agricultural Research Station in Qurna, affiliated to the Agricultural Research Department, the Ministry of Agriculture, Date at planting was in11/19/2020.

Also, the use of the Atlantis herbicide was obtained from the approved agricultural companies as in Table (3) showing the trade name of the herbicide used. A backspray with a capacity of 16 liters was used to spray the solutions of the herbicide and the extract at the studied dates. The spraying was carried out in the early morning to avoid the rise in temperatures. As for the comparison treatment, the study treatments were three spraying periods and five control treatments, so the number of experimental units used in the experiment (3 x 3 x 5), the total is 45 treatment The wheat crop was harvested on 17/4/2021.

The weeds was cut at the level of the surface of the soil and an area of a square meter from the center of the board and collected with paper bags after isolating it into broad-leaved weeds and narrow leaved weeds for each treatment and placed in an electric oven at a temperature of 70 ° C for 72 hours and then according to the dry weight For broad-leaved weeds (1988, Al-chalabi). Plant height (cm) The height of the plant was measured from the level of the soil surface to the base of the spike of the stem of the main plant, As the average of ten plants were taken randomly for each experimental unit (Pedro et al., 2012) spike length (cm^2) The spike length was measured for ten spikes randomly From the base of the spike to its terminal , from each experimental unit in the experimental field. Grain yield (ton ha^{-1}) After completing the threshing process of the sample harvested for an area of square meter, the straw was separated and then the grain was weighed at 14% moisture (A. OA C,1975) for each experimental unit converted to ton ha^{-1}. Biological yield The biological yield was estimated by the weight of the plants harvested from the same area taken for the study, the yield, which includes the weight of the total dry matter of the grains plus the straw, (Hambiln and Donald 1976)

Results and discussion

Dry weight broad-leaved weeds.

The results of the analysis of variance indicate a significant effect of weeds control treatments and spraying intervals and the interaction between them on the dry weight of broadleaf weeds. It is clear from the results in Table (2) that the two spraying treatments with sorghum extract + full concentration of the pesticide, as well as the spraying with sorghum extract with half the amount of pesticides, reduced the dry weight of the broad-leaved bush accompanying the wheat used in this trait, if it gave the lowest average weight The dry bush reached (7.36) gm m2 and (7.74) gm m2 respectively in comparison with the other treatments, as the comparison treatment gave the highest average dry weight of (9.52) gm m2, which did not differ significantly from the treatment of spraying with Atlantis, the average treatment of which was (9.29) g M2 That this difference in the response to spraying with extracts and pesticides may be due to the efficiency of these extracts and pesticides in their effect on the growth of the bush through their interference with the physiological processes that occur in the plant, which leads to the inhibition of the photosynthesis process by stopping the Hill reaction and also stopping the work of Acetohydroxycytase enzyme (AHLS), which works on the deterioration of cell division and prevents the formation of proteins and amino acids, and this came similar to what was reached by Haddad (2015) and Ahmed (2011) who mentioned that the use of herbicide in the fight against weeds causes a decrease in its dry weight. The results in Table (2) indicate that the effect of spraying periods on dry weights in broad-leaved weeds, and that spraying on Tillering was better than the rest of the other Tillering used in the experiment, and gave the lowest average dry weight of broad-leaved bushes amounted to (7.34) g m2 compared to the rest of the branches. The spraying periods, which gave the highest average dry weight, the first period (before Tillering) and the third period (when elongation) reached 9.07 g m 2 and 9.10 g m 2 respectively, and this is consistent with what was reached by Muhammad, (2007) that spraying with pesticides and extracts after (30) days Planting had a significant effect on the dry weight of the weeds. As for the interaction between the two

factors of the study (extracts and herbicide treatments with spraying periods) in the results listed in the same table, it shows the superiority of spraying treatment with sorghum extract + full concentration of Atlantis herbicide with the second spraying period (at the Tillering). The lowest average dry weight of broad-leaved weeds was (3.97) gm m2, while the control treatment (non-spraying) and in the first two stages (when vegetative growth or Tillering) gave the highest rate of broad-leaved weeds and it was 10.11 and 9.50 gm/m2 respectively.

Table (2) Effect of weed control treatments and spraying periods on broad-leaved bush (gm.m2)

Control Treatments	Spraying			Average Treatment
	T1	T2	T3	
C1	9.20	9.45	9.22	9.29
C2	9.50	10.11	8.95	9.52
C3	9.62	4.77	8.83	7.74
C4	7.43	8.42	9.95	8.60
C5	9.58	3.97	8.53	7.36
LSD to interfere: 1.63				LSD for Treatment: 0.90
Spray average	90.7	7.34	39.10	
LSD to periods: 1.14				

Effect of control treatments on growth characteristics of wheat

Effect of bush control treatments and spraying intervals on plant height (cm)

The results indicated that there was a significant effect on the control and interaction treatments on the plant height trait and the absence of a significant effect on the spraying periods in this trait. The results in Table (3) showed that the spraying treatment (with sorghum extract + full concentration of the Tillering Atlantis) was the best among the control treatments. It gave the highest average plant height of (88.63) cm, (87.37) cm as the spraying treatment (with sorghum extract + half The amount of the Tillering Atlantis) and compared to the control treatment (non-spray) or spraying with sorghum extract only, the plant height was (84.21) cm and (84.38) cm. It led to a new opportunity for wheat plants to grow better as a result of reducing competition between them and the bush, and this result agreed with Hatim (2021). As for the effect of the interaction, it is noted that spraying (with sorghum extract + half the recommended amount of Atlantis herbicide) with the second spraying period (when Tillering) gave the highest average for the plant height characteristic, which did not differ significantly from the treatment of spraying (with sorghum extract + full concentration of the herbicide Atlantis) if they recorded a high rate of plant height of (93.52) cm and (93.42) cm respectively, where the treatment of sorghum extract with the second spraying period gave the lowest average plant height and was (81.56) cm. This result indicates that there is a response to all the control treatments in increasing plant height.

Table (3) Effect of weed control treatments and spraying intervals on plant height (cm)

Control Treatments	Spraying			Average Treatment
	T1	T2	T3	
C1	85.48	86.20	85.26	85.64
C2	82.54	85.84	84.24	84.21
C3	84.53	93.52	84.04	87.37
C4	86.70	81.56	84.87	84.38
C5	86.07	93.42	86.41	88.63
LSD to interfere: 4.06				LSD for Treatment: 2.06
Spray average	85.06	88.11	84.96	
LSD to periods: N.S				

Effect of weeds control treatments and spraying intervals on spike length (cm)

The results of the statistical analysis show that there is a significant effect in weeds control treatments and spraying periods and the interaction between them in the characteristic of spike length. If the results indicate in Table No. (4) that the spraying treatment with sorghum extract + half the concentration of the Atlantis herbicide gave the highest average rate of the treatment in the length of the spike, which amounted to 11.761 cm and did not differ significantly from the treatment of spraying with sorghum extract + full concentration of the herbicide Atlantis, while the comparison treatment (non-spraying) was the lowest average of 10,833 cm. The study led to a reduction in the competition between plants and bushes, and this in turn reflected positively on the growth of wheat plants well, and this result was identical to what was mentioned by Hatim 2021)), which agreed with Mahmood et al., (2013) and Khan (2015). The results of Table (4) show the superiority of the second spraying period (spraying at the branches), which gave the highest rate of 11.852 cm compared to the third spraying period, spraying at elongation, which gave the lowest rate of 10.672 cm.

Table (4) Effect of weed control treatments and spraying intervals on spike length (cm).

Control Treatments	Spraying			Average Treatment
	T1	T2	T3	
C1	10.790	11.450	10.737	10.992
C2	10.933	11.093	10.473	10.833
C3	11.403	12.230	10.950	11.761
C4	11.060	11.307	10.387	10.918
C5	11.137	12.480	10.813	11.477
LSD to interfere: N.S				LSD for Treatment: 0.53
Spray average	11.065	11.852	10.672	
LSD to periods: 0.64				

Effect of control treatments on yield components

Effect of weed control treatments and spraying intervals on grain yield (tons/ha).

It indicates the presence of a significant effect in the control treatments and the absence of a significant effect in the treatment of spraying intervals and the presence of a significant effect of the intervention between them in this trait. As the results shown in Table (5) indicate that the control by spraying with sorghum extract + the full concentration of the herbicide Atlantis gave the highest average rate The treatment, which did not differ significantly from the treatment of spraying with sorghum extract + half of the concentration of Atlantis herbicide, where the average treatment amounted to (5.240) tons Ha^{1} (5.231) tons Ha^{1}, respectively, compared to the treatment of spraying with Atlantis herbicide for a unit that gave the lowest rate of grain yield amounted to 4.671 tons Ha^{1} The reason for the superiority of this treatment in the yield is because of their superiority in the components of the yield that were discussed previously in the previous table and the effect of spraying the plant extract with the full concentration of the herbicide or with half the concentration leads to a reduction in the growth of the weeds and a reduction in its numbers and weight, and this was reflected well on the growth of wheat plants. This result agreed with Mengal et al. (2015) and Khan et al. (2012) and lqbal (2010). They confirmed a significant effect when using plant extracts, whether from field crops such as sorghum and sunflower, or from bush plants such as ragila and maid, and that When these extracts are combined with concentrations of weed killers to increase the effectiveness of the mixture and reduce the use of herbicide used in the control, and this result obtained is important in reducing the use of manufactured chemical herbicide as it increases environmental pollution in the case of large use of them and reliance on natural sources Like plant extracts that have toxicity as an allelopathic effect, this is consistent with what was reached by Hatim (2021). The results show in Table (5) the superiority of the interaction treatment spraying with sorghum extract + the full concentration of the herbicide with the second spraying period (at the Tillering), where the average treatment reached 6.257 tons hectares, which did not differ significantly from the treatment of spraying with sorghum extract + half the concentration of the herbicide with a period of time. The second spraying (at the Tillering), while the lowest rate of grain yield was obtained from the treatment of spraying with Atlantis herbicide with the third spraying period (spraying at elongation), which gave an average of 4.300 tons ha^{1}, which did not differ significantly from the comparison treatment (no spray).

Table (5) Effect of weed control treatments and spraying intervals on grain yield (tons/ha).

Control Treatments	Spraying			Average Treatment
	T1	T2	T3	
C1	5.123	4.590	4.300	4.671
C2	4.983	4.783	4.337	4.701
C3	4.933	6.183	4.577	5.231
C4	4.657	4.723	5.047	4.809
C5	4.640	6.257	4.823	5.240
LSD to interfere: 0.76				LSD for Treatment: 0.40
Spray average	4.867	5.307	4.617	
LSD to periods: N.S				

Effect of weed control treatments and spraying periods on the biological yield (tons/ha)

The results of the statistical analysis in the analysis of variance table showed that there were significant differences for the treatment of jungle control, spraying periods and interference in the biological yield. The results of Table (6) show that the treatments of spraying sorghum extract + the full concentration of Atlantis were superior to the rest of the spraying treatments, which did not differ significantly from the treatment of spraying sorghum extract + half the concentration of the herbicide Atlantis, which averaged 15,258 tons hectares and 15,192 tons hectares on The sequence compared to the spraying treatment with the Atlantis herbicide, which gave the lowest rate for this trait amounting to 14.210 tons (ha) and the reason for this may be due to the appropriate conditions and the treatment of the control by spraying the plant extract with the herbicide, whether the full concentration of the herbicide Atlantis or half a concentration in reducing the numbers of weeds present with plants Wheat and also reducing their (dry) weight, which provided an opportunity for wheat plants to grow without competition and to exploit the basic growth elements significantly in increasing the number of stalks and increasing the grain yield, which led to a reflection on the increase of the biological yield, this result agreed with Hatim (2021) and what was found by Khan and others (2015). As for the spraying periods, the results of Table (6) showed a significant effect, as the second spraying treatment (spraying at the Tillering) was superior, as it gave the highest average of the biological yield of 15,453 tons hectares compared to the third spraying period (spraying at elongation) which gave the lowest average of (14,391) tons hectares^{1}. As for the interaction characteristic, the results of Table (6) showed a significant effect of the interaction between the control treatments and the spraying periods. The spraying treatment with sorghum extract + half the amount of the herbicide Atlantis with the second spraying period (at the Tillering) gave the highest average biological yield of 16.940 tons ha^{1}, which did not Significantly different from the treatment of spraying with sorghum extract + full concentration of the herbicide Atlantis, while the treatment of spraying with Atlantis with the third period (spraying at elongation) gave the lowest average biological yield of 13,897 tons ha^{1}.

Table (6) Effect of weed control treatments and spraying periods on the biological yield (tons/ha).

Control Treatments	Spraying			Average Treatment
	T1	T2	T3	
C1	14.520	14.213	13.897	14.210
C2	14.127	14.783	14.467	14.459
C3	14.267	16.940	14.370	15.192
C4	14.607	14.560	14.810	14.659
C5	14.597	16.767	14.410	15.258
LSD to interfere: 0.73				LSD for Treatment: 0.40
Spray average	14.423	15.453	14.391	
LSD toperiods: 0.51				

Arabic sources

Ahmed, Mohamed Ramadan (2011). Response of the weeds accompanying the wheat crop to different spray rates of the weeds herbicide Chevaler. Tikrit Journal of Agricultural Sciences 11(4) 82-88.

Jadoua, Khudair Abbas (2003). Cultivation and service of the wheat crop: Ministry of Agriculture. The General Authority for Agricultural Guidance and Cooperation, Guidance Bulletin. 20 p.

Hatem, Ammar Youssef (2021). Effect of extracts of some weeds on the growth and yield of wheat (Triticum aestivum L.) and its accompanying weeds planted with different agricultural distances. Master Thesis. faculty of Agriculture. Albasrah university.

Al-Haddad, Khudair Qasim Khudair (2015). Diagnosis and control of weeds growing in wheat fields (Triticum aestivum L.) and its effect on growth, yield and protein characteristics, Master's thesis, University of Basra, College of Agriculture.

Foreign sources

A.O.A.C.(1975). Official Methods of analysis association of official analytical chemists , Washington , U.S.A.

Al-chalabi, F. T. (1988). Biological interaction between growth regulating substances and herbicides in weed control. Ph.D. Thesis, University of Wales, U. K. PP. 204.

Borrás, L., Slafer, G. A., & Otegui, M. E. (2004). Seed dry weight response to source–sink manipulations in wheat, maize and soybean: a quantitative reappraisal. Field Crops Research, 86(2-3), 131-146.

Donald , C.M. and J. Hamblin .(1976). The biological yield and harvest index of cereals as agronomic and plant breeding criteria . Adv. In Agro . 28 : 301-359.

Iqbal, J., Karim, F., & Hussain, S. (2010). Response of wheat crop (Triticum aestivum L.) and its weeds to allelopathic crop water extracts in combination with reduced herbicide rates. Pak. J. Agri. Sci, 47(3), 309-316.

Khan, E. A., Khakwani, A. A., & Munir, M. (2015). Effects of allelopathic chemicals extracted from various plant leaves on weed control and wheat crop productivity. Pakistan Journal of Botany, 47(2), 735-740.

Khan, M. A., Afridi, R. A., Hashim, S., Khattak, A. M., Ahmad, Z., Wahid, F., & Chauhan, B. S. (2016). Integrated effect of allelochemicals and herbicides on weed suppression and soil microbial activity in wheat (Triticum aestivum L.). Crop Protection, 90, 34-39.

Khan, N., Naveed, K., Hussain, Z., & Alam Khan, S. (2012). Assessment of allelopathic effects of parthenium (Parthenium hysterophorus L.) plant parts on seed germination and seedling growth of wheat (Triticum aestivum L.) cultivars. Pakistan Journal of Weed Science Research, 18(1), 39-50.

Mahlaf, A. K. A. K. (2019). The Impact of Residues Extract of Sorghum Plants Sorghum bicolor (L.) Moench and Johnson Grass Sorghum halepense in The Inhibition of

Germination and Growth of Some Weeds Plants of Wheat. Tikrit Journal for Agricultural Sciences,16(1), 30-42.

Mahmood, A., Rashid, A., Ali, M. A., & Waqar, M. Q. (2013). Efficacy of aqueous extracts of different allelopathic plants combined with reduced herbicide doses for weed control in wheat. Journal of Agricultural Research (03681157), 51(4)

Mengal, B. S., Baloch, S. U., Sun, Y., Bashir, W., Wu, L. R., Shahwani, A. R., ... & Baber, S. (2015). The influence of allelopathic weeds extracts on weeds and yield of wheat (Triticum aestivum L.). Journal of Biology, Agriculture and Healthcare, 5(1), 218-228.

Muhammad, S., Bashir, A., Khattak, R. A., & Arif, M. (2007). Integration of herbicides with aqueous allelopathic extracts for weeds control in wheat. In 8th African Crop Science Society Conference, El-Minia, Egypt, 27-31 October 2007 (pp. 209-212). African Crop Science Society.

Pedro, A.,R Savin, M.A.J, Parry, M. A., & Slafer, G. A. .2012.. Selection for high grain number per unit stem length through four generations from mutants in a durum wheat population to increase yields of individual plants and crops. Field Crops Research, 129, 59-70.

Rice, E. L.(2012). Allelopathy. Academic press.