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ACTIVITY OF HERBICIDE IODOSULFURON -MESOSULFURON AFFECTED BY MAGNETIC TREATMENT TO WEED CONTROL IN FIVE WHEAT CULTIVARS

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Abstract

Field experiment was conducted in the fields of Agriculture Collage, Kerbala University, Iraq, during winter season of 2016-2017 to evaluate the activity of herbicide iodosulfuron-mesosulfuron affected by magnetic treatment on weed control in five wheat cultivars. Randomized completely block design was used in split plot arrangement in three replications. The main plots were five wheat cultivars (Sham6, Bhoth 22, Ipa99, alfateh and Tahady) while herbicide treatments represent (100% and 50% of the recommendation of iodosulfuron -mesosulfuron) were made with or without magnetization of spray solution as sub plots. The results showed significant effect of the herbicide spraying solution by increasing efficiency of herbicide absorption by weeds and decreasing its density and biomass on the unit area. The weed control percentage used at half recommendation for the herbicide with magnetization has exceeded use of full recommendation concentration without a magnetization. The response of the cultivars to herbicide spraying treatments were various according to different susceptibility of the weeds competition and different growth season.

Key words *:* Magnetic water, herbicide, wheat cultivars.

Introduction

Wheat (*Triticum aestivum* L.) is one of the most important grain crops in Iraq and the world. It occupies the first place in terms of importance and area of cultivation. However, it weak competitor to weed associated compared to other cereal crops. Weed control is an important process to increase the yield, and susceptibility of some wheat varieties to impeding the growth of weed control is great importance in completion and integration of weed management process in crop fields such as wheat (Alziadee, 2015). Chemical herbicides are one of the most important means of reducing competition for economic yields, but their frequent use leads to health and environmental problems (Slomy, 2014). Controlled of weed using the chemical herbicides provides necessary requirements for the growth of crop so as to make it possible to store surplus of dry material resulting from net photosynthesis in several parts of plant, such as stems, leaves and roots, and converts a section of this gasoline into grain when starting grain filling operations, that affects quotient and its components (Safi, 2016).

Iodosulfuron-mesosulfuron, which belongs to the Sulfonyl-urea group is one of the most important herbicides used in weed control of narrow and broad leafed in wheat fields, both soft and durum, barley and triticale. Rate of growth of the species and the morphological, physiological and biochemical factors are among the factors attributable to the variation in the competitiveness of the varieties of wheat in the accompanying. (Shati, 2014). Varieties of wheat have differed in the competitiveness of their associated ad factory and the existence of weed that has caused a clear reduction in the qualities of growth and the quantity of the items under study (Al-Chalabi and Al-Agidi, 2010). Appling magnetic water technology has emerged in agriculture (magnetic technology), or so-called magnetic bio stimulation to raise crop productivity through the creation of desirable stimulation such as the

acceleration of plant metabolism and changes in the characteristics of live membranes (Lahmod *et al.*, 2016). The use of some applications to increase herbicide absorption by weeds, leads to high efficient control and reduces herbicide spraying rates and thus reduces environmental contamination and material cost (Hatami *et al.*, 2016). Magnetic water treatment reduces surface tension and changes in Phyto-water properties, making it easier to absorb by plants (Sueda., 2007; Pang, 2008) a greater increase in the readiness of nutrients when sprayed on the plant (Alfarttoosi, 2014). The magneto spray solution of the chevalier herbicide at 4000 gaus to discourage the germination and growth of the *Lepidium sativum* plant (Ruzic *et al.,* 2008). When using magnetic technology in 7000 Gsand the publisher Frigate with herbicide in control of Wild Oats there were moral differences in reduction of surface tension, increase in herbicide penetration and increase in the control rate of wild oats when using both technologies. (Mohassel and Aliverdi, 2012). Magnetic technology used in 500, 1000 and 2000 Gs improved efficacy of the trifluralin herbicide used to control weeds cotton crop. (Al-Chalabi and Alfarttoosi 2012). Irrigation of corn crop with the magnetic water with intensity 2000 Gs has reduced the density of weed and increased control percentage and effect of adding 2 kg.he^{-1} of Atrazine herbicide was not significant from adding 4 kg of herbicide without magnetic water. (Al-Chalabi and Al-Jebbori, 2012). Al-Chalabi and Al-khaldy (2014) found that magnetic treatments of the Glyphoset and fluazifop-butyl spray solution by 1000 and 2000 Gs with adding 75% of the recommended dose of herbicides may approximate their effect with the treatment of adding 100% of the recommendation of herbicides with normal water, which has increased the efficacy of the herbicides and reduced the number of tiller and rhizomes of *Imprata cylendrica* L plant. The aim of this study was to evaluate the activity of Iodosulfuron-mesosulfuron herbicide applied with magnetic technology agents weed of five wheat cultivars.

Materials and Methods

Experiment was conducted in the fields of the Agricultural College of Kerbala University during the winter seasons 2016-2017. Experimental unit was 6 m^2 with dimensions 2 × 3 m. Wheat was planted at a rate of 120 kg. h^{-1} as lines (20 cm distance lines). Fertilizer phosphate (triple super phosphate 48% P_2O_5) was added at a rate of 250 kg.h^{-1} sowing and nitrogen fertilizer (urea 46% N) at 300 kg.h^{-1} through seasons with four applications (Jadoaa, 2003), the first applied was added at sowing and the rest were added at different stages of plant growth (Tillering, potting, and flowering).

Randomized completely block design (R.C.B.D.) was used as split plot arrangement with three replications. Study was included planting five cultivars of Bread wheat: Sham6, Bhoth22, Fateh, Ipa 99 and Tahady as main plot while the weed control treatment represented with use of the iodosulfuron –mesosulfuron herbicide 100% of the recommendation (300 g.h^{-1}) alone or with magnetized spraying solution, iodosulfuron–mesosulfuron with 50% of the recommendation and with magnetized spraying solution and control treatment (without a herbicide). The amount of water was calculated on the 400 L.h^{-1}. The water magnetization device was used with the severity of 3000 Gs attached with spray tube on the treatments. Spraying of herbicide was applied at arrival of the weeds plant to fourth stage of the leaves at the early morning by backpack sprayer, under constant pressure. When crop plants were arrival to physiological stage maturity, the existing weeds were counted and their types diagnosed in each experimental unit in the way Squares. The intensity of the weed and weed percentage are estimated in each experimental unit wheat crop reaches the stage of physiological maturity.

The data were analyzed statistically according to the variation analysis method (ANOVA) for R.C.B.D, with split plot arrangement and use of the last significant difference test (L.S.D) to compare arithmetic means of treatment at a level of probability (5%).

Results and Discussion

Weed density (plant per m^2)

There were significant differences among wheat varieties and weed control treatment and interaction between it in weed density, (Table 1). Fatih cultivar having lowest density (10.92 plants.m^{-1}), while Bhoth cultivar have a higher-density of weed (21.00 plants.m^{-1}). These differences among the varieties (cultivars) may be due to the different their ability to suppressive of weed growth (Challaiah, *et al*., 1986 and Hossain, 2010). Weed control treatment at 100% recommended dose of herbicide (iodosulfuron-mesosulfuron herbicide) with magnetization of spraying solution recorded of 5.40 plants per m^{-1} while the control treatment was recorded the higher density amounted to 35.40 plants. Interaction between wheat varieties and weed control treatments where the lowest rate weed density, that interaction were appeared in full dose of herbicide (100% Recommended dose) with magnetization and two varieties (Sham6 and Tahady) compared with highest rate density of weed amounted to 45.00 plants recorded with control treatment and Tahady variety. Competitive ability of wheat cultivars against weed depending on different these cultivars by morphological

and maturity date (Karim, 1999) or ability of cultivars to tillering and competition (Al-Chalabi and Al-Agidi, 2010). Magnetization of herbicide may be increase efficiency of weed control through increasing of herbicide absorb by leaves due to enhances water characters (Mohassel and Aliverdi, 2012) an this companion with cultivar ability of weed competition (Alfarttoosi *et al*., 2018). Water magnetization technology has been reducing surface tension and increasing the permeability of herbicide through membranes (Sueda *et al.*, 2007 and Pang, 2008). This study happen with Alfarttoosi et al(2018) which noted that companion of magnetic herbicide and some wheat cultivars were high suppressive on weed.

Weed control Percentage (%)

(Table 2) shows that there were significant differences among cultivars and weed control treatment and interaction between it, Tahady cultivar recorded highest percentage of weed control by 68.67%, while Bhoth cultivar recorded a lower percentage of weed control 49.20%. Full recommended herbicide with magnetization spray water treatment happened the highest rate of control (83.78%) followed by the treatment of the recommendation without magnetization which recorded 75.90% without significant difference from half recommendation dose magnetization treatment that achieved 70.15%. The highest rate of interaction recorded by the. Interaction between wheat cultivars and herbicides treatment showed that Tahady cultivar was more efficiency of weed control under all herbicides treatment compared with other cultivars. The full or half recommendation of the herbicicde with magnetization of the spray solution was more efficient with some cultivars that a competitive weed such as the Fateh, compared to other cultivars. The magnetization of the spray solution improved the efficiency of the herbicide with the competitive varieties of the weed and this increased the efficiency of the control process. However, 20% of the total weed in the control treatment was not affected by the herbicide in all treatment, and this may be due to the resistance of these plants against the chemical control, which is referred to by many references (Huffman *et al.*, 2016 and Hatami *et al*., 2016)

Number of spikes per m^2

Table 3. appeared that there are differences effects among wheat cultivars and weed control interaction on number of spikes per square meters. Ipa 99 cultivar was highest rate (334.0 spike) per meter while the lowest rate recorded with fateh variety (256.0 spike). The high number of spikes were recorded when using half herbicide recommendation with magnetization of spraying solution(324.3 spike) has overtaken the addition of the herbicide full recommendation with or without magnetization water, which recorded 299.2 and 299.3 spike, However the lowest rate of this characteristic was recorded by the control treatment, (268.7 spike). The treatment of combine between Sham 6 cultivar half herbicide treatment with the magnetization water achieved the highest rate of 392.0 spike per m while the lowest rate of

Table 1: Effect of magnetization herbicide solution and wheat cultivars on weed density (plant per m^2).

Herbicide treatment	Wheat Cultivars					Mean
	Sham6	Bhoth	Ipa99	Fateh	Tahady	
Control (Water magnetization only)	25.00	42.00	40.00	25.00	45.00	35.40
Herbicide(full Recommended dose) without magnetization	7.00	15.00	15.00	0.67	4.00	8.33
Herbicide(full Recommended dose) magnetization	2.00	12.00	4.00	7.00	2.00	5.40
Herbicide(half Recommended dose) magnetization	10.00	15.00	6.00	11.00	5.00	9.40
L.S.D 0.05	3.59					1.67
Mean	11.00	21.00	16.25	10.92	14.00	
L.S.D 0.05	1.84					

Table 2: Effect of magnetization herbicide solution and cultivars of wheat on control percentage (%).

Herbicide treatment	Wheat Cultivars					Mean
	Sham6	Bhoth	Ipa99	Fateh	Tahady	
Control (Water magnetization only)	0.00	0.00	0.00	0.00	0.00	0.00
Herbicide(full Recommended dose) without magnetization	69.84	61.13	61.89	95.96	90.70	75.90
Herbicide(full Recommended dose) magnetization	91.96	71.31	90.10	69.99	95.52	83.78
Herbicide(half Recommended dose) magnetization	57.08	64.38	84.63	56.22	88.46	70.15
L.S.D 0.05	7.41					3.20
Mean	54.72	49.20	59.15	55.54	68.67	
L.S.D 0.05	4.69					

Table 3: Effect of magnetization herbicide solution and cultivars of wheat on number of spikes (spike per m^{-2}).

Herbicide treatment	Wheat Cultivars					Mean
	Sham6	Bhoth	Ipa99	Fateh	Tahady	
Control (Water magnetization only)	184.0	371.3	288.0	252.0	248.0	268.7
Herbicide(full Recommended dose) without magnetization	348.0	328.0	340.0	220.0	260.0	299.2
Herbicide(full Recommended dose) magnetization	352.7	312.0	368.0	252.0	212.0	299.3
Herbicide(half Recommended dose) magnetization	392	216.0	340.0	300.0	372.0	324.0
L.S.D 0.05	31.84					12.27
Mean	319.2	306.8	334.0	256.0	273.0	
L.S.D 0.05	23.85					

Table 4: Effect of magnetization herbicide solution and cultivars of wheat on number grain per spike.

Herbicide treatment	Wheat Cultivars					Mean
	Sham6	Bhoth	Ipa99	Fateh	Tahady	
Control (Water magnetization only)	58.80	67.60	72.80	74.00	50.20	64.68
Herbicide(full Recommended dose) without magnetization	78.40	73.60	60.80	81.20	78.80	74.56
Herbicide(full Recommended dose) magnetization	50.40	63.60	51.60	46.00	78.26	57.37
Herbicide(half Recommended dose) magnetization	60.00	58.00	53.20	50.87	57.60	55.93
L.S.D 0.05	1.59					0.47
Mean	61.90	65.70	59.60	63.08	66.21	
L.S.D 0.05	1.41					

was recorded in the treatment of the interaction of Sham-6 and weedy treatment, which reached 184.0 spike per m. The number of spikes usually depending of tiller per plant and succeed it competition of weeds or control it (Al-Chalabi and Al-Agidi, 2010). Some cultivars of wheat have ability to weed competition and this ability can be enhancement of herbicide activity (Baghestani, 2006). Combined of competitive cultivar and herbicide with enhance of permeability of herbicide by magnetic treatment possibility increase succeed of tillar with having spikes (Almutrafi *et al*., 2014). Successful weed control reducing the competition for the harvest and allowing to plant had a good vegetative total. Increasing the number of fertile spikes comes as a direct result of the availability of growth requirements due to lack of competition (Lahmod, 2012). Weed treatment with a herbicide effective in reducing the intensity and dry weight of the weed (Table 1.). This was positively reflected to increase of cereal crop during the seasons of study.

Number of grains per Spike^{-1}

Table 4 shows difference effect on the number of grains among wheat varieties and weed control treatments and their interaction. Tahady cultivar was superior by high grain per spike (66.21), while the lowest rate was recorded with Ipa 99 variety, which reached a lower mean of 59.60 grain. Weed control treatment have achieved a full recommended dose of spraying iodosulfuron-mesosulfuron herbicide than 74.56 grain, while the spraying of spraying half dose of herbicide with magnetization was recorded 55.93 grain per spike. As for the interference between Fatah cultivar and the treatment of spraying herbicide at rate 100% of the recommendation is the highest rate of this characteristic 81.20 grain, while the lowest rate of this characteristic is recorded by the treatment of interference between the Fatah cultivar and treatment spraying of the iodosulfuron -mesosulfuron herbicide at 100% of the recommendation with magnetization water recorded 46. 0 grain.

The number of grain per spikes, usually correlated with other yield components as number of spike per plant and grain weight (Lahmod and Alsaadawi, 2014), therefore, increase of number of spike per plant perhaps decrease from number of grain per spike because competition of nutrient which will be result the minimum of assimilations to sink (grain) supply from source (leaf), due to Ipa99 cultivar was had high number of spike per plant (334 spiks in table 3) while had less number of grain per spike (59.60 grain). Contrast with Tahady cultivar which had less number of spike table 3 while had high number grain per spike. This result corresponding with Al-Chalabi, and Al-Agidi, (2010) study on wheat cultivars.

Weight of grain(g)

Table 5 shown a significant different among wheat cultivars and weed control treatment. Bhoth 22 cultivar was best weight of 1000 grains (37 g) compared with lowest weight (28.68 g) was to Fateh cultivar. Weed control by herbicide and magnetic too variance according to treatment. Herbicide (full Recommended dose) without

Table 5: Effect of magnetization herbicide solution and cultivars of wheat on 1000 grain weight (gm).

Herbicide treatment	Wheat Cultivars					Mean
	Sham6	Bhoth	Ipa99	Fateh	Tahady	
Control (Water magnetization only)	35.03	33.83	32.08	32.03	32.55	33.10
Herbicide(full Recommended dose) without magnetization	32.39	36.87	40.16	30.14	38.98	35.71
Herbicide(full Recommended dose) magnetization	28.58	37.97	28.15	25.34	20.25	28.06
Herbicide(half Recommended dose) magnetization	27.66	40.15	31.56	27.20	25.63	30.44
L.S.D 0.05	0.80					0.68
Mean	30.91	37.20	32.99	28.68	29.35	
L.S.D 0.05	0.26					

Table 6: Effect of magnetization herbicide solution and cultivars of wheat on grain yield (ton per ha).

Herbicide treatment	Wheat Cultivars					Mean
	Sham6	Bhoth	Ipa99	Fateh	Tahady	
Control (Water magnetization only)	4.52	3.66	3.19	2.85	5.30	3.90
Herbicide(full Recommended dose) without magnetization	3.47	6.46	4.00	5.16	5.60	4.94
Herbicide(full Recommended dose) magnetization	4.88	3.59	4.36	3.31	3.36	3.90
Herbicide(half Recommended dose) magnetization	4.37	4.83	5.69	4.12	5.49	4.90
L.S.D 0.05	0.26					0.11
Mean	4.31	4.63	4.31	3.86	4.94	
L.S.D 0.05	0.18					

magnetization recoded high weight of 1000 grain achieved 35.71 g, while lees weight of 1000 grain was achieved with herbicide (half Recommended dose) magnetization treatment. Companion of wheat cultivars and weed herbicide treatment were significant difference in grain yield. however, increase of grain yield of weight corresponding with ability of cultivar on weed competition and efficiency of weed of herbicide

Grain Yield (ton per ha^{-1})

Table 6 shows that there are significant differences among of wheat varieties and weed control and their interaction on grain yield. Tahady cultivar was given highest rate of grains yield (4.94 ton. ha^{-1}) While Alfath was given lowest grain yield (3.86 tons.ha^{-1}). Weed control treatment were significant different. Use half dose of herbicide with the magnetization of the spray solution, given highest grain yield of 4.9 ton.ha^{-1} and without difference with herbicide of full dose alone, while the using of full dose of herbicide with magnetization, recorded the less yield (3.90 ton.ha^{-1}) without significant difference from control treatment which recorded a similar yield (3.90 ton.ha^{-1}). These result suggest that the process of magnetization may have increased the absorption of the herbicide by the crop and weed plants, but the high concentration of the herbicide affected the growth of crop due to absorption of wheat leaves a large amount of it although herbicide struggled well the weed (Table 1, 2). Half dose of the herbicide was sufficient to suppressive of weed without affecting on crop growth. The treatment of the herbicide magnetically reduces the surface tension and causes changes in the physical properties of the water and makes it more absorbed by the plant (Sueda *et al*., 2007 and Pang, 2008). Explained Mohassel and Aliverdi (2012) that use of magnetic technique and surfactant material (Frigate) with the Shivalier (Iodosulfuron-Mesosulfuron) to the control of weed reduced the surface tension and increased absorption of the herbicide and increased the rate of control of the weeds. All cultivars recorded a significant response to herbicide and magnetization according to their ability to compete with the weeds, however, it is noted that magnetization of the herbicide spraying solution increased the absorption efficiency of the herbicide by the crop and the weeds. It is noted that the use of half of recommendation for a herbicide with magnetization recorded a quotient that is not significant different from the use of the full recommendation without magnetization with all varieties. The use of magnetization with the full dose of the herbicide notes that it has reduced the grain yield, and the cause may be due to the absorption of large amounts of herbicide by the crop due to the magnetization process, which negatively affected the growth of the crop. The use of half of the recommendation dose with magnetization was sufficient to achieve a good control rate of weeds without affecting on wheat plant. Studies have indicated that many herbicides depend in their election on the amount of herbicide absorbed by the crop or the weed, where the crop can suppressive the action of the absorbed herbicide

within the plant to a certain extent, but if the amount of the absorbed herbicide is increased and the crop becomes non-resistant to the herbicide and may be damaged (Wyse, 1994)

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