EVALUATION OF CHEVALIER WG AND ATLANTIS OD HERBICIDES TO CONTROL WEEDS IN WINTER WHEAT FIELDS

I. A. Said [1,2] **D. M.A. Jaff [3]**
Researcher **Assist. Prof.**
[1]Plant Production Department, Khabat Technical Institute, Erbil Polytechnic University
[2]Field Crops Department, College of Agriculture, Salahaddin University
[3]Biology Department, College of Education, Salahaddin University

ABSTRACT
Herbicides are much more than just chemicals to control weed plants, and they can also influence the ecosystems. So, it is necessary to choose new herbicide with low active ingredients in order to reduce environmental issues, as well as control weed plants. A field experiment was conducted to evaluate the efficiency and to compare two herbicides containing similar active ingredients, Chevalier WG and Atlantis OD, as they contain metsufuron-methyl and iodosufuron-methyl sodium at different rates. Chevalier contains 30 g/l of each active ingredient; whilst Atlantis OD has 10 g/l of metsulfuron-methyl and 2 g/l of iodosufuron-methyl sodium. The results showed that all treatments significantly were active to control the weeds in both wheat varieties. Narrow-leaves Weeds density was decreased density 91.70 and 94.14% by Atlantis OD minus 25% in Aras and Simeto respectively, and the yield of Aras was increased 255%. In accordance with the results, a herbicide with low active ingredients, particularly from the sulfonylurea group such as Atlantis OD, more likely to be recommended for weed control and environmental concerns.

Keywords: herbicides; chevarlier, atlantis, wheat; weeds; yield

مجلة العلوم الزراعية العراقية -2020 :51(عدد خاص):96-100 سيد والجاف

تقييم مبيدين CHEVALIER WG و ATLANTIS OD في مكافحة الادغال في حقول الحنطة الشتوية

اسماعيل علي سيد[1و2] دارا محمد امين الجاف[3]
باحث استاذ مساعد
1- قسم الانتاج النباتي-جامعة بوليتكنك
2- قسم المحاصيل الحقلية- كلية الزراعة -جامعة صلاح الدين
3- قسم البايولوجي – جامعة صلاح الدين

المستخلص
مبيدات الأعشاب هي أكثر بكثير من كونها مجرد مواد كيميائية للتحكم في نباتات الأعشاب الضارة، بالاضافة الى ذلك يمكن أن تؤثر على النظم البيئية ايضا. لذلك، من الضروري اختيار مبيدات الأعشاب الجديدة ذات نسب قليلة من المواد الفعالة للحد من القضايا البيئية، وكذلك السيطرة على النباتات الأعشاب الضارة. تم إجراء تجربة ميدانية لتقييم الكفاءة ومقارنة مبيدين للاعشاب يحتويان على مواد فعالة مماثلة، Chevalier WG و Atlantis OD، حيث يحتويان على ميتسوفورون ميثيل ويودوسوفورون-ميثيل الصوديوم بمعدلات مختلفة. شوفالييه يحتوي على 30 جم / لتر من كل عنصر نشط. بينما يحتوي Atlantis OD على 10 جم / لتر من ميتزولفورون-ميثيل و 2 جم / لتر من الصوديوم iodosufuron-methyl. أظهرت النتائج أن جميع المعالجات كانت نشطة بشكل كبير للسيطرة على الحشائش في كلا النوعين من القمح. تم تقليل كثافة الحشائش الضيقة بكثافة 91.70 و 94.14 ٪ من قبل Atlantis OD ناقص 25 ٪ في Aras و Simeto على التوالي، وزاد محصول Aras بنسبة 255 ٪. وفقًا للنتائج، من المحتمل أن يوصى بمبيدات الأعشاب ذات نسب قليلة من المواد الفعالة، وخاصة من مجموعة السلفونيل يوريا مثل Atlantis OD، من أجل مكافحة الحشائش والحد من المخاوف البيئية.

كلمات مفتاحية: اعشاب، مبيدات ادغال، المادة الفعالة.

***Received:12/7/2019, Accepted:25/11/2019**

INTRODUCTION

Wheat crop is regarded the most important economic plant. It is classified first, followed by rice, maize and barley in terms of importance (13). However, there are constraints which are accountable for low wheat yield such as using of poor quality seeds, improper sowing, low seeding rate and imbalance use of fertilizers and irrigation; as well as weeds disruption, as it is the key factor in diminishing wheat yield (12). In addition, Abdul Khaliq (2) affirm that weed infestation in crop lands is the most devastating factor influencing adversely crop productivity; then, resulting in direct loss to quality and quantity of the products. The impact of weeds on crop is through competition on basic requirements of growth directly or to be indirect via allelopathy effect, and both decrease crops yield (3). According to studies in Iraq, weeds can cause in wheat yield reduction by 13-43% (1). Furthermore, several weed species have been found to cause yield reduction; including *Lolium rigidum, Sinapis arvensis, Raphanus raphanistrum, Avena fatua, Malva parviflora, Phalaris minor* and *Melilotus indicus* (16). The most effective method to control the weeds is herbicides, but during the past few decades this agrochemical has resulted in serious ecological and environmental problems involving weeds, crop plants and micro-organisms (2). So, it is always recommended to use low doses during the process of weed management, particularly those that have sulfonylurea, which is deemed less harmful to the environment and thus more effective at low rates (8). Furthermore, both Atlantis OD and Chevalier WG have recently been registered in Iraq as herbicides to control broad and narrow annual weeds. Both herbicides, produced by the Bayer Crop Science, contain Metsulfuron methyl and Iodosulfuron methyl sodium that are active ingredients of the sulfonylurea group (4), and are widely used to control broad leaf weeds as well as some annual grasses particularly *Avena sativa* in wheat fields (17). The Chevalier is most important herbicide recommended by the Ministry of Agriculture in Iraq to suppress weeds in wheat fields (9). Both active ingredients are adsorbed through leaves and stop the weeds growth after 48 hours by inhibiting ALS enzymes; then prevent new leaves formation (12). Thus, this paper studies a comparison between the two herbicides in controlling weeds in winter wheat field.

MATERIALS AND METHODS

Field experiment was conducted at Grdarasha research station of Agriculture College / Salahaddin University to evaluate the effectiveness and efficiency of the two new herbicides (Chevalier WG and Atlantis OD) used to control weeds in the wheat field. Chevalier WG herbicide was obtained from the Blue Field agricultural corporation, while Atlantis OD was supplied by Bayer Crop Science in Germany via their Amman office. Certified wheat seeds including Simeto and Aras (durum and soft varieties respectively) were obtained from Erbil Directorate of Agricultural Research. The seeds were cultivated in a prepared field using Randomized Complete Block Design (RCBD) with three replicates in November 2015. After the crops growth reached four leaves stage, the herbicides were sprayed at three doses (+25% of recommended rate, recommended rate and -25% of the recommended dose). Then, the following parameters were considered to illustrate the evaluation:

Plant material:

Wheat plants were sampled after the application of herbicides at flowering growth stage. Stem and spike lengths were examined (table-2)

Weed Control Efficiency (WCE):

The following formula was used to describe the efficiency of the herbicides as implemented by (Singh et al, 2013):

$$WCE=\frac{(x-y)}{x}\times 100$$

Where x = weed dry weight in weedy check and

y = weed dry weight in treated plots (table-3).

Yield Parameters:

Grains yield per hectare, 1000 grains weight (g), and number of grains per spike as well as the percentage of protein content were studied.

Table 1.Herbicides information

No.	Herbicide	Chemical name	Active ingredients	Recommended rate
1	Chevalier WG	Metsulfuron methyl: methyl-2-(4-methoxy-6-methyl-1,3,5- triazin-2-yl carbamoyl sulfamoyl) benzoate	Metsulfuron methyl 30g/L + Iodosulfuron methyl sodium 30g/L	300 g/ha
2	Atlantis OD	Iodosulfuron methyl sodium: methyl 4-iodo-2-[3-(4-methoxy-6-methyl-1,3,5-triazin-2-yl)ureidosulfonyl]benzoate, sodium salt	Metsulfuron methyl 10g/L + Iodosulfuron methyl sodium 2g/L	1L/ha

Source: (FAO, 2011; PMRA, 2004; Bayer Crop Science- Iraq)

RESULTS AND DISCUSSION

Table 2. Effect of the two herbicides on plant materials and yield parameters

Variety	Treatments	Plant material		Yield parameters				
		Spike Length (cm)	Stem Length (cm)	Spike /m^2	Grains/ Spike	1000 grains Wt. (g)	Yield (t/ha)	Protein %
Aras	Chevalier-25	11.6a	76.16ab	402.66a	42.53ab	33.93ab	5.71abc	12.64ab
	Chevalier-R	10.45ab	74.73abc	362.66ab	40.13ab	35.43ab	5.15abc	10.41ab
	Chevalier+25	10.4ab	69.56bcd	374ab	34.93b	38.13ab	4.92abc	11.15ab
	Atlantis-25	11.62a	72.8abcd	415.33a	44.86ab	35.43ab	6.47ab	10.84ab
	Atlantis-R	10.45ab	62.5d	351.33ab	38.06ab	32.2ab	4.42abc	11.48ab
	Atlantis+25	10.99a	70.66bcd	362.66ab	45.8ab	29.33b	4.83abc	9.78b
	Control	10.9a	83.05a	152.5c	39.8ab	29.45b	1.82c	10.53ab
Simeto	Chevalier-25	8.53bc	70.66bcd	325.ab	40.4ab	39.03ab	5.09abc	16.67a
	Chevalier-R	7.51c	64.73cd	407a	47.53ab	44.56a	8.41a	15.77ab
	Chevalier+25	7.21c	64.2cd	386.66ab	41.53ab	41.10ab	6.81ab	10.38ab
	Atlantis-25	8.59bc	70bcd	313.33ab	49.4ab	45.16a	7.003ab	10.9ab
	Atlantis-R	7.13c	63.6cd	277abc	38ab	40.90ab	4.45abc	11.38ab
	Atlantis+25	7.66c	67.23bcd	348ab	52.46a	42.80ab	7.006a	10.92ab
	Control	7.47c	69.4bcd	233.33bc	36.26ab	37.90ab	3.14bc	11.49ab

Table 3. Weed control efficiency of the two herbicides

Variety	Herbicides Concentrations	Weed Control Efficiency	
		Broadleaves	Narrow leaves
Aras	Chevarlier-25	95.32b	99.81a
	Chevarlier-R	97.69ab	99.15a
	Chevarlier+25	92.91b	99.39a
	Atlantis-25	94.96ab	91.70ab
	Atlantis-R	94.45ab	96.98b
	Atlantis+25	90.31c	99.77a
Simeto	Chevarlier-25	98.93a	92.13ab
	Chevarlier-R	87.79d	77.76d
	Chevarlier+25	99.10a	99.86a
	Atlantis-25	84.70d	94.14ab
	Atlantis-R	94.68b	99.87a
	Atlantis+25	94.65b	89.80bc

The prevalent species of weeds in the study area were *Avena sativa*, *Galium tricorne* and *Brassica napus*. Some species were also found in the field but with low density. However, the herbicides were significantly effective at low doses to control approximately all species of weeds (Table-3). Chevalier-R recorded the minimum control for both broad and narrow leaves for Simeto experiment plots which were 87.79 and 77.76, respectively. In contrast, Soltani and Saeedipour (2015) concluded that weeds dry matter were decreased as a result of increasing the rate or dose of Chevalier; whilst, the effectiveness of Atlantis was increased by increasing its dose to diminish the weed density. Razzaq et al. (15) also found that controlling weeds was enhanced by increasing Atlantis application rates; however, according to Malekian et al. (11) applying lowest rate (14.4 g/ha) of both active ingredients were effective markedly to diminish the weeds compared to (18 g/ha). Zand et al. (20) also confirmed in their work that weeds population was reduced by 96.4%

when (15+3 g/ha) of metsulfuron-methyl and iodosulfuron methyl sodium respectively applied; compared to (45+45 g/ha) rate, as reduced the weeds by 89.3%. Thus, low doses of metsulfuron methyl and iodosulfuron methyl sodium is sufficient to inhibit amino acid biosynthesis then prevent new leaves formation (12). Furthermore, all yield parameters were improved by both herbicide doses which recorded higher yield in comparing to the weedy check; exclusive protein percentage was not significant (Table-2). The results are similar to the finding's of Soltani and Saeedipour (19) results. Based on the data obtained from this study, it can be concluded that all treatments were effective to diminish the weed problem particularly *Avena sativa*, which is the dominant weed species in the field. The Atlantis OD herbicide which contains less metsulfuron methyl and iodosulfuron methyl sodium, 10 and 2 g/L respectively, is efficient to suppress the weed plants even at a low dose (minus 25% of the recommended dose). In addition, it did contribute to enhance the crop yield for both varieties. Thus, herbicides such as Atlantis OD with low active ingredients should be recommended in wheat fields for better weed controlling, environmental concerns and much more cost effective.

REFRENCES

1. Abadi, K. W. 2010. Comparing the effectiveness of some selective herbicides against weeds in bread wheat fields. Iraqi Journal of Agricultural Science, 41 (2): 150-158.

2. Abdul Khaliq, A. Matloob, A. Tanveer, A. Areeb, F. Aslam and N. Abbas. 2011. Reduced doses of sulfonylurea herbicide for weed management in wheat fields of Punjab, Pakistan. Chilean Journal of Agricultural Research, 71 (3): 424-429

3. Al-Chalabi, F. T. and W. F. Hammood. 2016. Response of growth analysis parameters of some cotton cultivars to integrated weed management. Iraqi Journal of Agricultural Science, 47 (1): 197-207

4. Bayer Crop Science of Iraq. Herbicides products. Available at: https://www.iraq.cropscience.bayer.com/Products/Herbicides/Atlantis-OD-42.aspx

5. Food and Agriculture Organization. 2011 Specification and Evaluation for Plant Protection Products, Metsulfuron-methyl, United Nations

6. Hamid, A. F. 2014. Yields and its components in several cultivars of wheat affected by weed control under sprinkler irrigation system. Scientific Journal of Kerbala University, 12 (2): 24-29

7. Kortekamp A editor. 2011. Herbicides and environment. Rijeka: Intech.

8. Kovach, J., C. Petzoldt , J. Degnil and J.Tette. 1992. A method to measure the environmental impact of pesticides, IPM program, Cornell University, New York State Agricultural Experiment Station

9. Lhamood, N. R. 2015. Role of the combined between sorghum residue and chevalier herbicide on weed control in wheat. Iraqi Journal of Agricultural Science, 46 (2): 186-195.

10. Management Regulatory Agency (PMRA). 2008. Iodosulfuron-Methyl-Sodium Technical Herbicide, Ottawa (Canada), Health Canada.

11. Malekian B., H. Ghadiri, S. Abdolreza Kazemeini and M. Edalat Efficacy evaluation of sulfosulfuron, metsulfuron-methyl plus sulfosulfuron, mesosulfuron-methyl plus iodosulfuron-methyl and iodosulfuron plus mesosulfuron herbicides in winter wheat (*Triticum aestivum* L.). Journal of Biodiversity and Environmental Science, 7 (21): 177-182.

12. Mohammed, A. T., R. K. Shati and A. J. Ali. 2016. Evaluate the effectiveness of the weed herbicide atlantis WG for Some varieties of wheat which be approved in Iraq and associated weed and its impact on the economic quotient. Anbar Journal of Agricultural Sciences, 14 (1): 183-194.

13. Mustafa, I. K. and O. K. Jbara. 2018. Forecasting the food gap and production of wheat crop in Iraq for the period (2016-2025). Iraqi Journal of Agricultural Science, 49 (4): 560-568

14. Queiroz, A.R.S, R.A.Vidal, I.C.Nava, M.T. Pacheco, L.C. Federizzi and E. Xavier. 2017. Selectivity of iodosufuron-methyl to oat cultivars. Planta Daninha. v35: e017165822

15. Razzaq, A., Z.A. Cheema, K. Jabran, M. Farooq, A. Khaliq, G. Haider and S.M.A. Basra. 2010. Weed management in wheat through combination of allelopathic water

extract with reduced doses of hercides. Pak. J. Weed Sci. Res. 16 (3): 247-256.

16. Shati, K. R. 2008. Effect of amounts of irrigation and herbicides on growth and yield of bread wheat and water use efficiency. Iraqi Journal of Agricultural Science, 39 (3): 37-54.

17. Shodhganga, Review of literature, Chapter 2: Metsulfuron methyl. Available at: http://shodhganga.inflibnet.ac.in/bitstream/10603/92291/7/08-chapter%202.pdf

18. Singh, R.K., S.R.K. Singh and U.S. Gautum. 2013. Weed control efficiency of herbicides in irrigated wheat (*Triticum aestivum*). Indian Res. J. Ext. Edu. 13 (1): 126-128

19. Soltani, F. and S. Saeedipour. 2015. Efficacy evaluation of some herbicides and different nitrogen levels for weed management and yield attributes in wheat. Walia. 31(S1): 39-43

20. Zand E., M. A. Baghestani, M. A. Alikhani, S. Soufizadeh, M. M. Khayami, R. P. Azar, P. Sabeti, M. Jamali, N. Bagherani and S. Forouzesh. 2010. Chemical control of weeds in wheat (*Triticum aestivum* L.) in Iran. Crop Protection, 29: 1223-1231.