Journal of Genetic and Environmental Resources Conservation, 2022, 10(1):14-19.
www.gercj.com Print ISSN: 2306-8663, Online ISSN: 2306 – 8280

Effect of herbicide mixtures in controlling the weeds accompanying for the wheat

Saddam H. A. Al-Ziady* and Reasan K. Shati
College of Agricultural Engineering Sciences, University of Baghdad, Baghdad, Iraq.
***Corresponding author: saddam.hatim@coagri.uobaghdad.idu.iq**
Received: September 15th 2021; Accepted: November 15th 2021

Abstract

A field experiment was carried out in the fields of a farmer in Wasit Governorate - Al-Shahimiya district within the action plan of the National Program for the Development of Wheat Agriculture in Iraq - the Ministry of Agriculture, with the aim of knowing a combination of Traxos herbicide with several hericides (Traxos + Hormony) and (Traxos + Lancelot). and (Traxos + Granstar). In the control of wild barley and other weeds associated with the wheat crop. A randomized complete block design (RCBD) with three replications was used. Treatment H6 gave the lowest weed density of wild barley and broad-leaved weeds, and the total weed density, with control percentage of 98.5%, 86.2%, and 94.9%, respectively. The two treatments H2 and H6 also achieved the lowest density of narrow-leaved weeds, which amounted to 0.0 plants. m^{-2} For both of them, with a control rate of 100%, compared to the weedy treatment, which gave the highest density of Abu Suef weed, narrow and broad weeds, and the total density. Treatment H6 achieved the lowest dry weight of wild barley weed and broad-leaved weeds and the total dry weight of weeds, and the inhibition percentage was 98.0%, 89.0%, and 94.0%, respectively. The efficiency of the two treatments H2 and H6 was similar in reducing the dry weight of narrow -leaved weeds, which amounted to 0.0 $g.m^{-2}$, and the percentage of inhibition was 100% for both treatments, while the weed treatment, which gave the highest dry weight of the Abu Suef weed and narrow and broad weeds, gave the total density of 44.2 and 46. 2, 56.6 and 147.0 $g.m^{-2}$, respectively. It is concloted, that the use of herbicide mixtures led to a reduction in the number and dry weight of weeds according to their specialization, as it had the best effect with barley weed when treated with H4, while the treatment H5 had the highest effect with broad-leaved weeds.

Keywords: Herbicide mixtures, Weeds, Control percentage, Inhibition.

Introduction

Chemical control of the weeds began since the middle of the last century, more than 60 years ago, through the use of specialized weed herbicides when controlling with crop plants. Penetration of resistance the type of chemical used must be changed, so the idea of using mixtures of weed herbicides came mainly to control weed plants, including those resistant to herbicides. Crops are usually accompanied by weed plants that have similar growth requirements to crop plants, and among the most important weeds accompanying wheat are *Avena fatua* L., *Lolium rigidum* Gau.D., *Lolium temulentum* L., *Mililotus indica* Mill., *Polypogon monspliensis* and other weeds. The problem of the spread of the wild barley weed (Abu Suef) has appeared in Iraq in the past few years, as the plants of this type of weed showed their high resistance to the known weed herbicides. Herbicide resistance is driven by the mechanisms of the target site (TS) and non-target site (NTS). TS resistance involves altering herbicide efficacy through structural modifications to the binding site or overexpression of a target gene, while NTS resistance is associated with different anatomical, cellular and physiological processes, such as reduction, uptake, translocation, altered cellular distribution, and herbicide detoxification (Delye et al., 2013). This experiment came with the aim of breaking the weed's resistance to herbicides and controlling the weed new types of weed such as wild barley.

Materials and Methods

A field experiment was carried out in the fields of a farmer in Wasit Governorate - Al-Shahimiya district within the action plan of the National Program for the Development of Wheat Agriculture in Iraq - the Ministry of Agriculture, with the aim of knowing a combination of Cronus herbicide with several herbicides (Cronus + Hormony), (Cronus + Lancelot), (Traxos + Granstar) in the control of wild barley and other weeds associated with wheat. The experimental land was plowed with a turntable plow and smoothed by means of disc harrows and leveled with a leveling machine. A randomized complete block design (RCBD) was used with three replications. The area of the experimental unit was 35 m^2 (7 m × 5 m). The seeds were sown on 12/13/2012 at a rate of 140 kg.ha-1 on lines with a distance between one line and another of 20 cm and were harvested on 5/6/2013. The experiment land was fertilized with nitrogen fertilizer at a rate of 200 kg $N.ha^{-1}$ in the form of urea 46% N and phosphate fertilizer (P_2O_5) at a rate of 120 $kg.h^{-1}$. Nitrogen was added in the first two batches, the first after 30 days of sowing, and the second 30 days after the first batch (Jaddoa,1995).

The following transactions were used in the experiment:

H1: Cronus at a rate of 720 ml. h^{-1}

H2: Cronus at a rate of 720 ml. h^{-1}+ Lancelot at a rate of 40 g. h^{-1}

H3: Cronus at a rate of 720 ml. h^{-1}+ Lancelot at a rate of 20 g. h^{-1}

H4: Cronus at a rate of 720 ml. h^{-1}+ Granstar at a rate of 20 g. h^{-1}

H5: Cronus at a rate of 720 ml. h^{-1}+ Hormony at a rate of 20 g. h^{-1}

T6: pyroxysulam at a rate of 500 ml. h^{-1}.

T7: Weedy (without control).

A back filter was used based on the use of 400 $liters.h^{-1}$. The herbicides were sprayed at the rate recommended by the producing companies. The weeds were diagnosed (Table 2) and their numbers were calculated by squares method using a wooden square. The weeds were cut at harvest from the soil surface level of each experimental unit for an area of one square meter and placed in a perforated paper bag and dried in an electric oven at a temperature of 75° C for 48 hours until the weight was stable. (Gautam and Sharma, 1987).

Table 1. Trade name, common name and of chemical strucure for herbicides used in the experiment.

No.	**Trade Name**	**Common name**
1	Cronus Ec	Clodinafop-Propargyl+Cloquintocetmex110%
2	Lancelot	Amino pyrolid30%WG
3	Pallas	Pyroxysulam OD 045
4	Granstar 75DF	Tribenuron- methyl 75 DF.
5	Hormony	Thinfensulfuron methyl + Tribenuron 75%WG

The percentage limits for reducing the number of weeds were calculated as in the equation used by (Ciba-Giegy,1975).

Control percentage % = Number of weeds in weedy - number of weed in control / Number of weeds in comparative treatment × 100.

Percentage of inhibition to dry weight of the weeds was calculated using the following equation. Inhibition ratio% = 100–(A / B × 100), As: A = dry weight of the weeds in the control treatment. B = dry weight of the weeds in comparison treatment.

After the tabulation and collection of data for all studied characteristics, statistically analyzed by the design of random sectors and averaged the mean averages using the least significant difference at the probability level of 0.05 (Steel and Torrie, 1980).

Results and Discussion

weed types: Table 2 The number of broad-leaved weed species is more than the narrow-leaved weed species prevalent in the experiment, as they included the weeds of *Beta vulgaris* L., *Silybum marianum* L., *Malva praviflora* L., *Ammi majus* L., *Sonchus oleraceus* L. and *Sinapis arvensis* L., while the number of types of weeds with narrow leaves was 5, which included *Avena fatua* L., *Lolium rigidum* Gau.D., *Hordeum bulbosum* L., *Lolium temulentum* L. and *Phalaris minor* L., it is known that weed plants differ in their competitiveness according to their species, as well as in their resistance to weed herbicides.

Table 2. The types of weeds studied.

The scientific name	English name
Broad-leaved weed species	
Beta vulgaris L.	Wild beets
Silybum marianum L.	Milk thistle
L. Malva praviflora	Dwarf mallow
L. Ammi majus	Common bishops weed
Sonchus oleraceus L.	Common sow
Sinapis arvensis L.	Wild mustard
Narrow-leaved weed species	
Avena fatua L.	Wild out
Lolium rigidum Gau D.	Rigid rye grass
Hordeum bulbosum L.	Abu suwaif
Lolium temulentum L.	Annual darnet
Phalaris minor L.	Lesser canary

These results agreed with Ahmadi and Alam (2013), Reddy et al. (2013), Singh et al. (2013), Abdul Khaliq et al. (2014), Al-Ziady (2015), Al-Ziady and shati (2019) and Moutuss et al. (2021) . The H6 treatment also gave the lowest average number of broad-leaved weeds of 3.0 plants. m^{-2} compared to the weed treatment that gave The highest average density of broad-leaved weed was 21.7 plants. m^{-2}. These results are consistent with, Yasine et al. (2013), Harasim et al. (2014) and Al-Ziady (2015) and Mahoney et al. (2016).

Treatment H6 gave the lowest average in the total weed density of 3.7 plants.m^{-2} compared to the weedy treatment, which gave the highest average of total weeds density of 65.0 plants.m^{-2}. The reason may be due to the fact that these herbicides have better effects than other herbicides through the presence of more than one active substance in relation to weed herbicide mixtures, which leads to the integration of their effect towards increasing the effectiveness of these substances in reducing the number of different weeds or one active substance with an effect in different locations from the effect of other herbicides. It made some weed plants more tolerant of herbicides.

Table 3. Effect of herbicide mixtures into weeds density.

treatment	Rate of using (ml-g).h^{-1}	weeds density (plants.m^{-2})			
		Abu suwaif	narrow-leaved	broad-leaved	total weeds
H1	720	6. 0	4.7	19.5	30.2
H2	720 + 40	4.3	0.0	20.7	25.0
H3	720 + 20	3.4	3.0	14.0	20.4
H4	720 + 20	1.1	3.2	11.5	15.8
H5	720 + 20	3.0	1.2	4.2	8.4
H6	500	0.7	0.0	3.0	3.7
H7	0.0	22.3	21.0	21.7	65.0
LSD 0.05		1.3	0.8	2.6	6.1

Dry weight (g.m^{-2}): Through Table 4. it was found a significant superiority of all herbicide treatments compared to the overgrown treatment, while the H6 treatment outperformed the rest of the treatments by achieving the lowest dry weight of wild barley weed plants amounted to 1.2 gm. m^{-2}, while the weedy treatment gave the highest average of the character in the range of 44.2 gm. m^{-2}. The two treatments H2 and H6 were significantly superior in achieving the lowest average dry weight of the weeds amounted to 0.0 gm.m^{-2} for both of them compared to the weed treatment which gave the highest dry weight of the narrow-leaved weeds of 46.2 gm. m^{-2}, as for broad-leaved weeds, treatment H6 significantly outperformed on the other treatments by giving the lowest average dry weight of the weeds amounting to 6.2 gm.m^{-2}, while the weeds treatment had the highest value of the trait amounted to 56.6 gm.m^{-2}, and the effects were reflected on the weed types separately in weight. The total dry weight of the total weeds by achieving the H6 treatment had the highest significant value in reducing the average total dry weight of the weed, which amounted to 7.4 gm. m^{-2}, while the overburdened treatment gave the highest average in the dry weight of the total weed that reached 147.0 gm.m^{-2}, these results agreed with Al-Ziady (2015), Al- Ziady et al. (2019), Mahoney et al. (2016). and Mishra et al. (2017).

The reason may be due to the fact that the presence of more than one active ingredient in relation to the herbicide mixtures leads to the complementarity of their effect towards increasing the effectiveness of these ingredients and this is reflected in the reduction of the dry weight of the weeds. On the other hand, the treatment H6 is superior to the other treatments. This indicates that the herbicide within this treatment is more effective in combating thin and broad-leaved weeds, despite containing only one active ingredient.

Control percentage: Table 5. shows the superiority of treatment H6 by giving the highest control rate for wild barley weed reached 98.5%. It is noted that the treatments of all herbicide mixtures had a clear effect on reducing the density of the Abu Suef weed through the high control percentage, which ranged between 73.1% - 92.8%. The treatments H6 and H5 also affected the increase in the rate of controlling broad-leaved weed, amounting to 86.2% and 82.9%, respectively. The treatments H6 and H5 also affected by increasing the percentage of total weed control, as it reached 94.9% and 86.6% respectively. Treatment H6 gave the highest percentage of total weed control, and this indicates the efficiency of this treatment (Pallas) in reducing the number of narrow and broad-leaved weeds (Table 3). These results agreed with Said and Jaff (2020), Wara et al. (2020) and Choudhary et al. (2021).

The percentage of inhibition of the dry weight of the weeds: Through the results of Table 6. It was noted that all herbicide treatments achieved a high percentage of inhibition in the dry weight of wild barley weed, ranging between 70.9% for treatment H1 and 98.0% for treatment H6, and all treatments achieved a high percentage of inhibition of narrow-leaves weeds with more than For 77.3%, the percentage of inhibition in the two treatments H2 and H6 was 100% for each of them. This result agreed with Nejad and others (2013) Fahad and others (2013), who explained that the use of mixtures of weed killers led to giving percentages of High inhibition, while not agreed with Singh et al (2013) and Yasine et al (2013). As for broad-leaved weeds, treatment H5 gave the highest inhibition rate in dry weight of 84.4%. As for the inhibition of the total dry weight of the weed, the percentage ranged between 54.2% in treatment H1 to 94.4% in treatment H6.

Conclusion

That the use of herbicide mixtures led to a reduction in the number and dry weight of weeds according to their specialization, as it had the best effect with barley weed when treated with H4 (Cronus at a rate of 720 ml. h^{-1}+ Lancelot at a rate of 40 g. h^{-1}), while the treatment H5 (Cronus at a rate of 720 ml. h^{-1} + Hormony at a rate of 20g. h^{-1}) had the highest effect with broad-leaved weeds.

Table4. Effect of herbicide mixtures into weeds dry weight.

treatment	Rate of using (ml-g).h^{-1}	dry weight of weeds (gm.m^{-2})			
		Abu suwaif	narrow-leaved	broad-leaved	total weeds
H1	720	12.9	4.7	48.3	65.9
H2	720 + 40	9.1	0.0	45.5	54.6
H3	720 + 20	7.4	6.2	31.7	45.3
H4	720 + 20	3.7	6.5	23.5	33.7
H5	720 + 20	6.2	4.6	8.8	19.6
H6	500	1.2	0.0	6.2	7.4
H7	0.0	44.2	46.2	56.6	147.0
LSD 0.05		1.2	0. 6	2.4	6.3

Table 5. Effect of herbicide mixtures on the percentage of control.

treatment	Rate of using (ml-g).h^{-1}	Control percentage			
		Abu suwaif	narrow-leaved	broad-leaved	total weeds
H1	720	73.1	77.6	12.4	54.4
H2	720 + 40	80.1	100	4.6	61.6
H3	720 + 20	83.5	85.7	35.5	68.2
H4	720 + 20	92.8	84.5	49.3	75.5
H5	720 + 20	86.5	90.5	82.9	86.6
H6	500	98.5	100	86.2	94.9
H7	0.0	0.0	0.0	0.0	0.0

Table 6. Effect of pesticide mixtures on the percentage inhibition of weed dry weight.

treatment	Rate of using (ml-g).h^{-1}	inhibition percentage			
		Abu suwaif	narrow-leaved	broad-leaved	total weeds
H1	720	70.9	77.3	14.7	54.2
H2	720 + 40	79.4	100	19.6	62.3
H3	720 + 20	83.3	86.1	44.0	68.3
H4	720 + 20	91.6	85.4	58.5	78.4
H5	720 + 20	86.0	89.7	84.5	86.5
H6	500	98.0	100	89.0	94.0
H7	0.0	0.0	0.0	0.0	0.0

References

Al-Ziady.S.H.A. 2015. The critical duration in weeds control of wheat. Iraq. J. Elphrates Agric. Sci\AL-Qasim Green Unversity. 7(1).143-154.

Al-Ziady, S. H. and R. K. Shati. 2019. Effect of six herbicides to control the wild barley and other weeds accompanied with wheat. Inter. Conference on Agric. Sci. IOP Conf. Series: Earth and Envi. Sci. 388: 1-9.

Al-Ziady,S. H. A., R. K. Shati, S. S. Ali, A. M. Hamid and F. A. Abboud. 2019. Response of wheat to weeds control by using different herbicides and effect into yield grain. Biochem. Cell. Arch. 19. (2): 3997-4001.

Abdul Khaliq, M. H., A. Matloob, A. Tanveer, S. Ibni Zamir, I. Afzal and F. Salma. 2014. Weed Growth, Herbicide Efficacy Indices, Crop Growth and Yield of Wheat are Modified by Herbicide and Cultivar Interaction. Pak. J. Weed Sci. Res. 20(1): 91-109.

Ahmadi ,A., and J. N. Alam. 2013. Efficiency of New Herbicide of Sulfosulfuron + Metosulfuron in Weed Control of Wheat. Int. J. Agron, and Plant Production. 4 (4): 714-718.

Choudhary, A. K., D.S. Yadav, P. Sood, S. Rahi, K. Arya, S.K. Thakur, R. Lal, S. Kumar, J. Sharma , A. Dass, S. Babu, R. S. Bana , D. S. Rana, A. Kumar, S. K. Rajpoot , G. Gupta 3, A. Kumar, N. M. Harish, A. U. Noorzai, G.A. Rajanna, M. H. Khan, V. K. Dua and R. Singh. 2021. Post-emergence herbicides for effective weed management, enhanced Wheat productivity, profitability and quality in north-western himalayas: A ‘participatory-mode’ technology development and dissemination. Sustainability. 13 (5425): 1-22.

Ciba-Giegy Agrochemicals Division .1975 . Field trial manual Ciba- giegy. S. A., Basle. Swizerland.

Délye, C.; Jasieniuk, M.; Le Corre, V. Deciphering the evolution of herbicide resistance in weeds. Trends Genet. 2013, 29, 649–658. [CrossRef] [PubMed]

Fahad, S., L. Nie, A. Rahman, C. Chen, C. Wu, S. Saud and J. Huang. 2013. Comparative Efficacy of Different Herbicides for Weed Management and Yield Attributes in Wheat. American J. of Plant Sci. 4: 1241-1245.

Gautam, R. C,and K.C. Sharma , 1987. Dry matter accumulation under different planting schemes and plant densities of rice Indian J. Agric. Res. 21(2) :101-109.

Harasim E., M. Wesołowski and C. Kwiatkowski. 2014. The Effect of Reduced Growth Retardant Rate on Weed Infestation of a Winter Wheat (*Triticum aestivum* L.) crop. Romanian , Agric. Res, 31:1-11.

Jaddoa, K. A.(1995) Wheat Facts and Guidelines. Publications of the Ministry of Agriculture. General Authority for cooperation and agricultural extension.

Mahoney, K. J., K. E. McNaughton and P. H. Sikkema. 2016. Control of Glyphosate-Resistant Horseweed in Winter Wheat with Pyrasulfotole Premixed with Bromoxynil. Weed Tech. 30(1):291-296.

Mishra, J. S., A. N. Rao, V. P. Singh and R. Kumar. 2017. Weed management in major field crops. Research Gate. https://www.researchgate.net/publication/309 77151 8

Moutuss, M, Z., A. R., M. Salim and S. K. Paul. 2021. Weed management practices effects on yield performance of wheat. J. of Res. in Weed Sci. (4): 1 : 70-82.

Nejad, A. Y., M. A. Fazel and A. R. Rezaomani. 2013. Studying the Effects of Using Herbicides and Split of Nitrogen Fertilizer on Yield and Yield Components of D79-15 Wheat. J. Agron. of Agric. and Crop Sci. 5 (21): 2584-2587.

Oerke, E. C., H.-W. Dehne. 2004. Safeguarding production—losses in major crops and the role of crop protection. Crop Protection. 23 : 275–285.

Reddy, S. S., P. W. Stahlman and G. W. Patrick. 2013. Downy Brome (*Bromus tectorum* L.) and Broadleaf Weed Control in Winter Wheat with Acetolactate Synthase- Inhibiting Herbicides. Agron. 3: 340- 348.

Said, I. A. and D. M.A. Jaff. 2020. Evaluation of chevalier WG and atlantia OD Herbicides to control weeds in winter wheat fields. Iraqi J. of Agric. Sci.:51(Special Issue):96-100.

Singh S. P., P. Pandey, M. Kumar, S. Singh, N. S. Pandey and D. Srivastva. 2013. Growth and Biochemical Responses of Wheat (*Triticum aestivum* L.) to Different Herbicides. African. J. of Agric. Res. 8. 14: 1265-1269.

Steel, R. G., and J. H. Torrie. (1980) Principles and Procedures of Statistics. Mc Graw Hill Book Company. Inc. USA. pp., 485.

Wara, T. U., M. Begum, M. Abdul Kader, S. Rasul, M. Hasan and S. Monira. 2020. Effect of herbicides on weed control and performance of wheat. 3 (2): 102-113.

Yasine, R., M. R. Kahn, G, Abbas, M. Irshad, Z. Abbas, R. M. Sarfraz, M. B. Khokhar and M. Amer. 2013. Efficacy of Herbicides for Control of Broad Leaf Weeds in Wheat(*Triticum aestivum* L.) Crop. Sci. Int. 25 (4): 829-832.