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Effect of Atlantis Herbicide on Milk Thistle Weed (Syllibium Marianum) Under Spraying Growth Stages Differ

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Annotation: The research was conducted in the College of Agricultural Technology during 2022 / 2023 to study effect of Atlantis herbicide on the Milk thistle weed (*Syllibium marianum*) when spraying stages differed. The research incorporated several factors, with the first being the concept of Atlantis herbicide concentrations (recommended concentration, higher than the recommended concentration, less than the recommended concentration, as well as the comparison treatment). The second factor: timing of spraying the herbicide (cotyledonous leaf stage, four-leaf stage, pre-flowering stage), The Milk thistle weed seeds collected from the previous season 2021/2022 were planted in the pots have a diameter of 30 cm and a height of (30) cm, after filling them soil with ten seeds per pots, which were thinned to five plants, leaving (5) cm at the top. For the purpose of irrigation. A completely randomized design (CRD) was used in planning and implementing the research, with three replications (Al-Rawi and Khalafallah, 1980). The data were analyzed statistically by computer and using the SAS system, the multiple-range test (Duncan, 1955) was utilized to compare significantly different means. were distinguished. At a probability level of 0.05 with various letters of the alphabet. The results showed: Increasing the concentration of Atlantis herbicide from (0 to 400) $gm.ha^{-1}$ was accompanied by a clear and significant effect on *Syllibium marianum* plants, as the degree of

impact reached (8) degrees at the concentration is high at 400. g.ha^{-1}, and there was also the *Syllibium marianum* species has experienced a gradual and substantial decrease in height plant and the number of its roots increased with increasing concentration of the herbicide, as the number of germs reached zero at the high concentration, and the wet and dry weight of the *Syllibium marianum* L. plant decreased at the same concentration, reaching (3.88 and 0.94) grams for the two plants, respectively. Early herbicide spray significantly affected plant shoots, while late spray increased plant height, number of shoots, and weight, reaching 38.50 cm, 3.16 g., 16.66 g., and 6.25 g. respectively. The interaction between the concentrations of (300) g.ha^{-1} and (400) g.ha^{-1} are being studied and spraying at cotyledon stage caused killing of the cotyledon plants. The interaction between the concentration (400) g.ha^{-1} and spraying in four-leaf stage achieved the lowest plant height, as it reached (4 cm), and the interaction between the concentration (300) g.ha^{-1} and spraying in the four-leaf stage recorded the lowest number of cuts, as it reached (1.33) tillers. The interaction between the concentration (400) g.ha^{-1} and spraying at the four-leaf stage achieved the lowest wet weight and the lowest dry weight of the *Syllibium marianum* plants, reaching (2.33 g and 0.53 g), respectively.

Keywords: Atlantis herbicide, chemical control, *Syllibium marianum.*

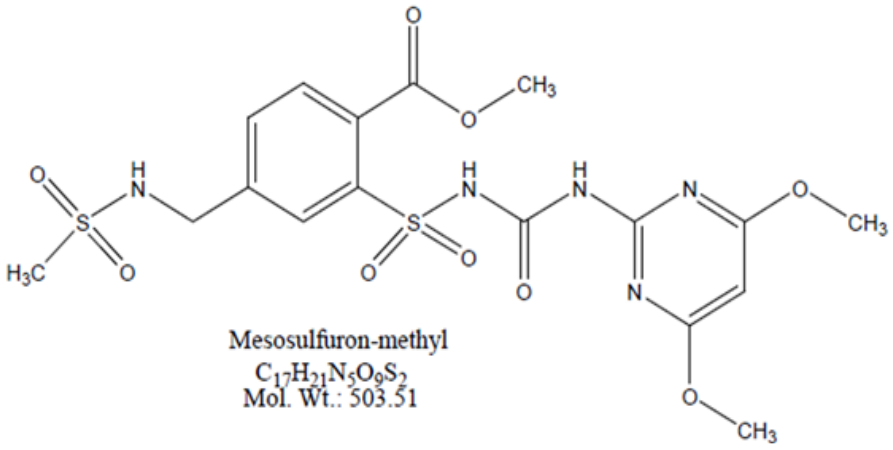
Introduction

Herbicides are chemical compounds that kill, inhibit, or prevent the growth of weeds or their reproductive organs. The vast majority of them are organic compounds that have high physiological activity when used at relatively low rates. There are also some inorganic compounds that are used as insecticides. Insecticides are characterized as herbicides. selective herbicides and non-selective herbicides, which work as either contact herbicides or system herbicides (Al-Mafarji, 2015). Despite the major role that weeds play in preserving soil moisture and improving soil properties by increasing the percentage of organic matter resulting from the remains of these weeds and preventing them from eroding, in addition to their importance considering that many weed growing areas are considered natural pastures, at the same time they cause Large losses far exceed other losses, and the use of herbicides has surpassed the use of all other methods of combating jungles, especially in recent years. At the same time, it is clear evidence that traditional control methods, by relying on mechanical and agricultural means, have become secondary means in the field of weed control, with chemical control taking precedence over them, especially since there are many studies, experiments and research that confirm that chemical control of weeds is more efficient than using agricultural methods. Mechanical operations such as hoeing, weeding, etc. (Al-Mallah and Al-Jubouri 2012). Herbicides are the predominant method used to combat weeds in global agriculture, and the sale of herbicides around the world annually is estimated at billions of dollars (Kraehmer, 2012). The fields of wheat and barley crops are spread with many thin and broad-leaved weeds, which represent a serious threat to the production of these crops.

These weeds are widely spread among winter crops in more than 60 countries around the world (Taylor, 2013). The accumulation of dry weed biomass (weed dry weight) is an applicable criterion for evaluating the nature of weeds for resource use and competition with crop plants, and herbicides are usually effective in reducing weed biomass compared to the control treatment (Hameed et al. 2019). Kumar et al., (2013) confirmed that if weeds are not controlled in the critical stages of the crop, it may cause a decrease in yield, which may reach 66%. weeds compete with crop plants for the essentials of life (water, light, nutrients) and cause huge losses, which suggests the adoption of strong and comprehensive management strategies in crop management. Atlantis herbicide is one of the systemic herbicides (Pre-Mix) produced by Bayer, which is used to combat thin and broad-leaved weeds in wheat fields. It consists of two active substances: the first is (Mesosulfuron - methyl at a rate of 30 $g.kg^{-1}$) and the second (Iodosulfuron methyl at a rate of 6 $g.kg^{-1}$). In addition to the protective substance (Mefenpyr - diethyl - methyl 90 $g.kg^{-1}$), the adhesive (wetting agent) Bio-power is also added at a rate of 0.5 $liters.ha^{-1}$ for the purpose of increasing the efficiency of the herbicide. This herbicide belongs to the sulfonylurea family and works to inhibit the biosynthesis process of amino acids. and proteins, which results in stopping the growth of the thin and broad-leaved weed immediately after spraying, with the appearance of yellow spots on the leaves and their wilting and then death within (3-4) weeks after spraying (Bayer Crop Science, 2008). *Syllibium marianum* is an annual weed plant that spreads in agricultural and non-agricultural lands. Therefore, we find this bush found on the edges of fields and on the edges of irrigation canals. It also grows in abandoned lands around industrial facilities, power stations, etc., and the fact that the leaves and flowers of *Syllibium marianum* contain tough thorns prevents farm animals from feeding on it, it is one of the plants that grows abundantly, especially in rainy years. The height of this plant may reach (2-3) meters. The *Syllibium marianum* weed plant is a broad-leaved weed. Its English name is Thistle, and its scientific name is *Syllibium marianum*. It belongs to the Asteraceae family. Its flowers are purple in color. *Syllibium marianum* has many harms, including that it is a refuge for many pests that attack crops, blocking irrigation channels and making it difficult to reach them. the main harm to this weed is the fires it causes, as its dry leaves are quick to ignite and fly, leading to fires breaking out in wheat and barley fields. It is a cause of fires in industrial facilities and electrical stations (Al-Mallah, 2019).

Materials and Methods

The research was conducted at the Agricultural Technical College during the 2021/2022 agricultural season, to study the effect of Atlantis herbicide on the *Syllibium marianum* when spraying dates for the herbicide differed. The research included two factors: The first factor: Atlantis herbicide concentrations, which are (0, 200, 300, 400) $grams.ha^{-1}$, the second factor: dates for spraying the herbicide (cotyledonous leaf stage, four-leaf stage, pre-flowering stage). *Syllibium marianum* weed seeds were planted in anvils with diameters of (30) cm and height of (30) cm, after filling them with soil with ten seeds. In the pots, it was thinned to five plants, leaving 5 cm at the top for the purpose of watering. A completely randomized design (CRD) was used in planning and implementing the research with three replications (Al-Rawi and Khalaf Allah, 2000), and at the end of the season the following characteristics were studied: degree of vulnerability, plant height, number of shoots, wet weight of the shoots, and dry weight of the shoots. The data were analyzed statistically by computer and with the SAS system, and the multiple range test (Duncan, 1955; Saleh and Hussein 2020; Alrawi and Ahmed 2024) was used to compare the means, so that the means that differed significantly from each other at the probability level (5%) were distinguished by different alphabets.



Chemical composition of atlantis herbicide

Results and discussion

Degree of impact:

The study shows that increasing atlantis herbicide concentration from 0 to 400 g.ha^{-1} significantly impacts *Syllibium marianum* plants, with an impact degree reaching (8) degrees at high concentration, similar to Mawlood and Hayawi's (2022) findings (table 1). The degree to which plants are affected by the herbicide decreases when spraying is delayed until advanced stages of the plant's life, as the data show that spraying the herbicide on plants in the pre-flowering stage was less affected than those that were sprayed in the cotyledon and four-leaf stages. The data indicates that the interaction between the concentration (200) g.ha^{-1} of the two factors is significant.and spraying at the cotyledon stage achieved the lowest effect on the cotyledon plants, as the degree of influence reached (2) degrees, and that the highest degree of influence was achieved when the interaction between the concentration (400) g. ha^{-1} and the cotyledon stage, which reached (7.67) degrees, and the interaction between the concentration (300 and 400) g.ha^{-1} and spraying the herbicide at the cotyledon stage caused the killing of the *Syllibium marianum* plants.

Table (1) The effect of the concentration, spraying time of Atlantis herbicide and the interaction between them on the degree of susceptibility.

Herbicide concentrations, g.ha^{-1}	Stages of spraying Atlantis herbicide			
	cotyledonous leaf stage	four-leaf stage	Pre-flowering stage	Herbicide concentrations
0.0	0.0 f	0.0 f	0.0 f	0.0 d
200	2.0 e	6.7 c	4.3 d	4.33 c
300	10.0 a	6.3 c	4.3 d	6.89 b
400	10.0 a	7.7 b	6.3 c	8.00 a
Spraying time	5.5 a	5.17 a	3.72 b	

Similar letters mean there are no significant differences at the 0.05 % level

Plant height (cm.):

The statistical analysis results are presented in table. (2) show that increasing concentration of atlantis herbicide from (0 to 400) g.ha^{-1} the increase in plant height was accompanied by a gradual and substantial decrease, as height reached (4.89) cm. at the high concentration of the substance is 400 g.ha^{-1}. Spraying herbicide in early stages of the plant's life may lead to the cessation of cell division, which ultimately leads to stunting of the plant. This could be attributed to the mechanism of action of the herbicide, which is one of the systemic herbicides that prevent cell division, which causes the plants to be stunted (Muhammad et al., 2016).

The interaction between the concentration is high at 400 g.ha^{-1} and spraying time at the four-leaf stage achieved the lowest height of cotyledon plants, as the height reached (4) cm. The interaction between the two concentrations (300 and 400) gm.ha^{-1} and the spraying time of the pesticide at the cotyledon stage caused In killing the *Syllibium marianum* plants, the highest height of the *Syllibium marianum* plants was achieved in the control treatment and all growth stages.

Table (2) Effect of concentration, spraying time of Atlantis herbicide and their interaction on plant height (cm)

Herbicide concentrations, g.ha^{-1}	Stages of spraying atlantis herbicide			
	cotyledonous leaf stage	four-leaf stage	pre-flowering stage	Herbicide concentrations
0.0	66.67 a	66.67 a	70.00 a	67.77 a
200	26.67 c	10.67 d	31.67 c	23.00 b
300	0.00 e	26.67 c	41.67 b	22.78 b
400	0.00 e	4.00 e	10.67 d	4.89 c
Spraying time	23.33 c	27.00 b	38.50 a	

Similar letters mean there are no significant differences at the 0.05 % level

Number of tillers:

Table (3) reveals a significant decrease in the number of shoots of the Syllibium marianum plant at concentrations of 200 and 300 g.ha^{-1}. This means that amount of herbicide absorbed by weed plants (escaping from the action of the herbicide) was sufficient to inhibit the growth of the plant's basal buds. exposed to low concentrations (Hayawi et al., 2021), and that the concentration of 400 g.ha^{-1} caused the killing of *Syllibium marianum* plants, which indicates that the herbicide behaved like contact herbicides in its effect due to the increased concentration. Spraying the herbicide is used in its early stages of plant's life achieved a significant decrease in the number of shoots of cotyledon plant, as number decreased to (1.91) shoots when the herbicide was sprayed at cotyledon stage, to (2.25) shoots when spraying at the four-leaf stage, compared with the number of shoots. Which reached (3.16) shoots when spraying in the pre-flowering stage (Al-Mafarji, 2015). The data indicates that the interaction between the concentration (300) g.ha^{-1} and spraying herbicide in the four-leaf stage achieved the number of shoots of the *Syllibium marianum* plant has experienced a significant decrease. The number reached 1.33. which did not differ significantly from the interaction between the study analyzed the concentration of cotyledons at 200 g.ha-1 and their two stages and four-leaf stage.

Table (3) Effect of concentration, spraying time of atlantis herbicide and their interaction on the number of tillers

Stages of spraying atlantis herbicide				
Herbicide concentrations, g.ha^{-1}	cotyledonous leaf stage	four-leaf stage	pre-flowering stage	Herbicide concentrations
0.0	6.0 a	6.0 a	6.0 a	6.0 a
200	1.7 c	1.7 c	3.3 b	2.2 b
300	0.0 d	1.3 c	3.3 b	1.5 b
400	0.0 d	0.0 d	0.0 d	0.0 c
Spraying time	1.92 c	2.25 b	3.15 a	

Similar letters mean there are no significant differences at the 0.05 % level

Wet weight of shoots (g.):

Table (4) shows that increasing herbicide concentration leads to a significant decrease in *Syllibium marianum* weed foliage wet weight, with percentages reaching 40.37, 61.93, and 86.70%, respectively. Early spraying the application of the herbicide resulted in a substantial reduction in the wet weight of the shoots by (40.51 and 18.96)% for the two spraying stages (cotyledonous leaf

stage and four-leaf stage) compared to the pre-flowering stage. The study shows a gradual decrease in foliage wet weight with increasing Atlantis herbicide concentration (0 to 400) g.ha^{-1} at each spraying stage lowest wet weight of the foliage of the *Syllibium marianum* weed was achieved when the concentration was interacted with the high concentration (400) g.ha^{-1} and spraying at the four-leaf stage amounted to (2.33) gm, and the two concentrations (300 and 400) gm.ha^{-1} caused the killing of *Syllibium marianum* plants when spraying at the cotyledon stage.

Table (4) Effect of concentration, spraying time of atlantis herbicide and their interaction on the wet weight of shoots (g)

Stages of spraying atlantis herbicide				
Herbicide concentrations, g.ha^{-1}	**cotyledonous leaf stage**	**four-leaf stage**	**pre-flowering stage**	**Herbicide concentrations**
0.0	24.0 a	24.3 a	24.3 a	24.2 a
200	11.7 d	16.3 c	18.3 b	15.4 b
300	0.0 g	11.0 d	16.7 bc	9.2 c
400	0.0 g	2.3 f	7.3 e	3.2 d
Spraying time	8.9 c	13.5 b	16.6 a	

Similar letters mean there are no significant differences at the 0.05 % level

Dry weight of shoots (g):

The data is presented in table (5) show the dry weight of the shoots decreased significantly at The herbicide concentrations have been thoroughly tested the comparison is made the control treatment is being considered the percentage of decrease reached (30.3, 61.84, and 91.35)% The three concentrations are listed, respectively, compared to the control treatment, and perhaps reason for this is attributed to this trait was linked to the wet weight of the shoot, and this result was consistent with what was reached by (Hayawi, 2015). The results also show that delaying the spraying date until the pre-flowering stage caused an increase in the dry weight of the shoot, reaching (6.25) grams, which indicates that early spraying of the herbicide achieves positive results in terms of the dry weight of the shoot. The reason for this is due to the small size of the weed plants and the speed of herbicide molecules moving inside the plants through the transport vessels and reaching the areas of influence. This result was consistent with what was obtained (Al-Mufarji, 2015). The study indicates a gradual decrease in the trait at each spraying stage with increasing herbicide concentration. as the highest dry weight reached (9.33) grams when the interaction between the control treatment and the pre-flowering stage occurred, while the interaction between the concentration achieved (400) gm.ha^{-1}, and the four-leaf stage has the lowest dry weight of the shoot, reaching (0.53) gm. While the interaction between the concentration (300) gm.ha^{-1} and spraying at the cotyledon stage, as well as the concentration (400) gm.ha^{-1} and spraying at the cotyledon stage, caused the death of cotyledon plants.

Table (5) Effect of concentration, spraying time of Atlantis herbicide and their interaction on the dry weight of shoots (g)

Stages of spraying atlantis herbicide				
Herbicide concentrations, g.ha^{-1}	**cotyledonous leaf stage**	**four-leaf stage**	**pre-flowering stage**	**Herbicide concentrations**
0.0	7.7 b	8.3 a	9.3 a	8.4 a
200	3.7 d	6.3 c	7.7 b	5.9 b
300	0.0 h	3.3 de	6.3 c	3.2 c
400	0.0 h	0.53 g	1.7 f	0.7 d
Spraying time	2.85 c	4.60 b	6.25 a	

Similar letters mean there are no significant differences at the 0.05 % level

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