Effect of Different Foliar Herbicides on Weed Control, Yield and Its Component of Simeto (*Triticum durum* L.)

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**ABSTRACT:**

A field experiment was conducted at the Technical Institute Research Station of Khabat to study the efficiency of three herbicides on the control of weeds in *Triticum durum* L. (Simeto variety). The herbicides were Pallas (for broadleaves and grasses), Traxos (for grasses) and 2, 4-D amine salt (for broadleaves). Three doses of each of the herbicides were applied at the five leaf stage of the crop. Characteristics studied were growth index, yield component and quality of the wheat variety. In addition, weed control and reduction percentages were calculated. The data show the significant efficiency of the treatments. However, the crop was severely affected by the Pallas doses application, although it was more effective than any others herbicides applied in this work to decrease number of weeds in a meter square.

**KEY WORDS:** Herbicides, durum wheat, weed control, yield

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**INTRODUCTION:**

Wheat (*Triticum aestivum* L.) is considered the staple food for more than one third of world population (Kaur et al., 2017). The yield of this crop is markedly affected by weeds density, as their losses to wheat yield approximately account between 35% to 57% (Petrova et al., 2015). However, there are several methods that can be used to control weeds in cereal crops; viz; prevention, mechanical, cultural, physical, biological as well as chemicals. Each method may be used alone or together, as an integrated weed management for a successful weed control program (Qasem, J. R., 2011).

However, using of herbicides in the past two decade has been tested to increase markedly crop yield by reducing the effect of weed problems in cereal fields. Due to different weed types (grasses and broadleaves); many herbicides have been developed to use in crop fields (Kumar and Singh, 2010). Furthermore, incorrect using of herbicides might be hazardous to the health of the farmers and their crops; as well as to the environment. Thus, the farmers should consider several factors that affect the herbicides efficiency, including the choice of using the correct product to certain weed, timing of the treatment, equipment inspection and maintenance, calculation of the dose applied, application techniques and safety (Wopereis et al., 2009). Accordingly, this experiment was conducted to study the effective of three different herbicides as foliage application for the control of weeds in wheat variety Simeto.
MATERIALS AND METHODS

An experiment was carried out at the Technical Institute Research Station of Khabat's district, 40 km west of Erbil. The land was prepared by plowing with moldboard plow, and then rotavator was used for harrowing; then the area for this experiment was designed as randomized complete block with three replications, each block was divided into 10 experimental units (12 m²). Seeds of *Triticum durum* L. (Simeto variety) were sown at 30 kg/plot. The three herbicides used were Pallas (for broadleaves and grasses), Traxos (for grasses) and 2, 4-D amine salt (for broadleaves) (Table-2).

Three doses of each of the herbicides were applied as recommended dose, plus 25% of the recommended dose and minus 25% of the recommended doses. The spray was performed at five leaf stage of the crop according to the Zadock scale for wheat growth stages (DPI-NSW, n.d).

Data collection: After five weeks of the treatments application, the number of weeds was counted in a meter square (Table-1) and then the control percentage of the weeds by the herbicides was calculated and analyzed statistically. In addition, data were taken for the growth rate of the crop by measuring the main stem length and number of tillers for ten plants which were taken in the middle rows of the experiments unit. Also, the ten main stem and spikes were placed in oven at 70°C for 48 hours to dry, and the dry matters were weighed.

The percentage of weeds control was calculated by the following formula (Jassim and Rudhan, 2011):

\[
C.W = \frac{A - B}{A} \times 100
\]

Where:
- C.W= Weed control percentage
- A= Number of weeds in Control plots
- B= Number of Weeds In treated Plots

| No. | Scientific name               | Family        |
|-----|-------------------------------|---------------|
| 1.  | *Hordeum gluacum* L.          | Poaceae       |
| 2.  | *Lolium rigidum* L.           | Poaceae       |
| 3.  | *Bromus sp. L.*               | Poaceae       |
| 4.  | *Vulpia octoflora* L.         | Poaceae       |
| 5.  | *Malva parviflora* L.         | Malvaceae     |
| 6.  | *Matricaria anthemis* L.      | Asteraceae    |
| 7.  | *Fumaria officinalis* L.      | Fumariaceae   |
| 8.  | *Brassica napus* L.           | Brassicaceae  |
| 9.  | *Plantago lanceolate* L.      | Plantaginaceae|

Reduction Percentage:

Reduction percent was calculated by taking weeds samples in every plot through quadrat meter square, and the weeds plant were weighted freshly then put in oven at 70°C for 48 hours to
obtain the dry matter. The following formula was used to calculate Reduction%.

\[
\text{Reduction \%} = \frac{\text{fresh wt of weeds} - \text{dried wt of weeds}}{\text{fresh wt}} \times 100
\]

### Table-2: Common, trade and chemical names of the herbicides.

| No. | Common Name | Trade Name | Chemical Name                                                                 | Recommended dose |
|-----|-------------|------------|--------------------------------------------------------------------------------|------------------|
| 1   | 2,4-D       | 2,4-D amine salt | 2,4-dichlorophenoxy acetic acid amine salt                           | 1 L/ha           |
| 2   | Pallas      | Pyroxsulam | N-(5,7-dimethoxy[1,2,4]triazolo[1,5-a]pyrimidin-2-yl)-2-methoxy-4-(trifluoromethyl) pyridine-3-sulonamide | 0.5 L/ha         |
| G R a i n P r o t e i n | Traxos | Pinoxaden and clodinafop propargyl | 2,2-dimethyl-propionic acid 8-(2,6-diethyl-4-methylphenyl)-1,2,3,4-tetrahydro-7-oxo7H-Pyrazolo[1,2-d][1,2,5]oxadiazepin9-ylester (Pinoxaden) (R)-2-[4-[(5-chloro-3-fluoro-2-pyridinyl)oxy]phenoxyl]propionicacid propynyl ester (clodinafoppropargyl) [(5-chloro-8-quinolinyloxy)-aceticacid1-methylhexyl ester | 1 L/ha |

### Grain Protein Content:
Protein percent of the grains was determined by Kjeldahl method at Agriculture College – University of Duhok.

### Yield Production:
Yield was calculated according to spike/m², grains per spike and weight of 1000 grains.

## RESULTS
There were significant variations of herbicides application on stem and spike dry matter of wheat (Figure 1&2). Pallas doses had markedly negative on stem dry matter of the crop particularly the recommended concentration. In addition, all doses of traxos as well as 2, 4-D (R+25%) treatments had negative on stem dry matter and reduces the stem dry matter of the plant (figure-1). Similarly, the spike dry matter of the crop was also affected by the treatments. Generally, pallas doses, in particular the recommended-pallas treatment, and traxos (R-25%) were effective to diminish the spike dry matter of wheat (figure-2)
Furthermore, Pallas treatments especially the R and (R+25%) were effectively decreased stem length of the crop. In addition, the traxos concentrations reduced the stem length but were better than the pallas doses (figure-3).
However the pallas treatments had negative effects on growth index of the crop, the herbicide (pallas) at all doses were more effective than the other treatments in weed control; as the calculation of weed control percentage explains more in (Table-3).

**Table-3:** Weed control and reduction percentage of grasses and broadleaves in wheat field by different herbicide rates:

| Herbicides (Treatments) | Weed Control Percentage | Reduction % |
|-------------------------|-------------------------|-------------|
|                         | Grasses | Broadleaves | Grasses | Broadleaves |
| 2, 4-D(R-25%)           | 0.0     | 55.56 b     | 0       | 79.46 a     |
| 2, 4-D (R)              | 0.0     | 59.26ab     | 0       | 74.89a      |
| 2, 4-D (R+25%)          | 0.0     | 85.19 ab    | 0       | 77.15a      |
| Pallas (R-25%)          | 94.29a  | 92.59a      | 81.13a  | 79.40a      |
| Pallas (R)              | 95.71a  | 100 a       | 100a    | 92.22a      |
| Pallas (R+25%)          | 94.29 a | 92.59 a     | 100a    | 100a        |
| Traxos (R-25%)          | 75.71b  | 0.0         | 33.22b  | 0           |
| Traxos (R)              | 77.14 b | 0.0         | 41.37 b | 0           |
| Traxos (R+25%)          | 64.29 b | 0.0         | 43.56 b | 0           |
| Mean                    | 83.57   | 80.86       |

*herbicide rates:
DISCUSSION:

Hordeum glaucum was the main infesting weed in the experiment area, as well as, Fumaria officinalis and Matricaria anthemis, and some other species which have been shown in table-1. Generally, the herbicides applications were effective to reduce weeds population; in particular, the pallas treatment at all doses. Dalga, et al. 2014 reported that Pyroxsulam is a very good herbicide to control broadleaves as well as grassy weeds. However, the concentration of the herbicide greatly affected the crop growth index such as stem dry matter and spike dry matter; also the stem height of the crop. The negative impact on the crops growth rate was due to delay the growth of the plant. In addition, the Traxos treatment showed different effect on both weeds and the crop. The higher dose of the herbicide was relatively more effective than the recommended and R-25% dose. Chhokar, et al. (2015) in their investigation concluded that 50 and 60 g active ingredient of Pinoxaden 2.53% + Clodinafoppropargyl 2.53% (the two main components of Traxos) were more effective to reduce weeds population than 40 g. Also, this herbicide influenced had detrimental impact on parameters such as stem length and stem dry matter but was R less than Pallas (Figure 1 and 2). Furthermore, the 2,4-D + 25% was effective to diminish broadleaf weeds population and did not injury the crop compared to Pallas then Traxos. Based on this investigation, further study is needed to explain precise application of Pallas as well as the dose, as the herbicide was more efficient to diminish the weeds population despite the crop was affected.

Furthermore, the herbicides had different impact on protein percentage. The three concentrations of 2, 4-D herbicide had no effect on protein content similarly to Traxos. Shaw et al. (1955) in their test of 2, 4-D on wheat grain protein included that Protein content was a more precise index of the effect of 2, 4-D on wheat than yield. In addition, the doses of traxos herbicide showed no impact on protein percent of the grain. Tagour et al. 2011 confirmed in their work that different rate of traxos did not affect the protein percent of wheat grain. Furthermore, all pallas concentrations reduced the protein percentage; particularly the (pallas R+25%) dose (table-4).

Table-4: Effect of herbicides doses on yield and yield components of Wheat:

| Treatments       | Spike no./m2 | Grains /Spike | 1000 grains weightt. (g) | Yield (t/ha) | Grain Protein % |
|------------------|--------------|--------------|--------------------------|--------------|-----------------|
| Control          | 217.33 a     | 25.73 ab     | 38.10 ab                 | 2.08 a       | 13.45 ab        |
| 2,4-D (R-25%)    | 192 a        | 24.39 ab     | 40.13 ab                 | 1.84 ab      | 12.8 ab         |
| 2,4-D (R)        | 186.66 a     | 23.91 ab     | 36.13 ab                 | 1.51 ab      | 13.70 ab        |
| 2,4-D (R+25%)    | 194.66 a     | 24.69 ab     | 39.03 ab                 | 1.86 ab      | 13.05 ab        |
| Pallas (R-25%)   | 174.66 a     | 16.86 bc     | 27.03 b                  | 0.77 b       | 13.03 ab        |
| Pallas (R)       | 184 a        | 14.88 c      | 32.20 ab                 | 1.03 ab      | 12.94 ab        |
| Pallas (R+25%)   | 250 a        | 10.59 c      | 35.50 ab                 | 0.92 b       | 12.82 b         |
| Traxos (R-25%)   | 186.66 a     | 23.62 ab     | 42.70 a                  | 1.80 ab      | 13.08 ab        |
| Traxos (R)       | 174.66 a     | 24.63 ab     | 41.80 a                  | 1.77 ab      | 13.32 ab        |
| Traxos (R+25%)   | 153.33 b     | 26.81 a      | 36.53 ab                 | 1.52 ab      | 13.16 ab        |

Conclusion

However, the herbicide can be effective to reduce the weeds problem in wheat fields, it might influence growth parameters of the crop. The pallas was the most effective to reduce weeds biomass but affected the crop growth index. So, the pallas herbicide needs more research to be its...
impacts explained then recommended to the farmers.

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