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Avena sterilis L. (wild oat) response to Clodinafop-propargyl in wheat crops in Morocco

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Abstract— *Avena sterilis is problematic weed that affects wheat production. The aim of this study is to investigate the effect of Clodinafop-propargyl on A. sterilis infestation in a soft wheat crop. The experimental design was Randomized Complete Block Design (RCBD) with three replications. Each block contained 4 elementary plots, 3 plots of which were treated with three rates of application of Clodinafop-propargyl and one untreated control plot. Trial were conducted in Ouazzane region of Morocco in January 2018. Treatments were carried out with a knapsack sprayer with the nozzle delivering a 3 bar jet. A quadrant of 1m x 1m was used to calculate percentage of A. sterilis density reduction and biomass reduction. A. sterilis dry biomass were determined using an oven at 75 ° C for 48 hours. Then, weighed with a precision balance. Results showed that treatments with Clodinafop-propargyl at 60 g/ha and 80 g/ha gave the best control of A. sterilis infestations recording respectively 96.1% and 99.4% of A. sterilis density reduction and 98.2% and 99.7% of A. sterilis dry biomass reduction. Clodinafop-propargyl at 40 g/ha recorded lower efficacies 75.3% and 80.1% respectively on A. sterilis density reduction, and A. sterilis dry biomass reduction.*

Keywords— ***Avena sterilis, Clodinafop-propargyl, wheat, density, biomass.***

I. INTRODUCTION

Weeds compete on water, minerals and sunlight and decrease wheat production in Morocco (Zimadahl & El Brahli, 1992; Boutahar, 1994; Taleb, 1996; Bouhache, 2007; Bouhache, 2017). *Avena sterilis* L. (wild oat) belongs to *Poaceae* botanical Family. It is an annual plant. Upright 50 cm to 1.50 m high. Leaves with limbs usually hairy at its base and on the margin. Eroded-acute ligule. No auricles. Panics 30 to 50 cm long. Lower flowers covered with silky hairs and twisted dorsal edges (Tanji, 2005). Upper hairless flowers. Flowers stand out together at maturity. Equal glumes, 3 to 5 cm, Spikelet with 3 to 5 flowers. Spread flower Spikelet forming an open V. Brown or black seeds, 2 to 3 cm long and 3 to 6 mm wide, 5 to 6 cm long (Tanji, 2005). Plant quite abundant throughout Morocco. It grows on different types of soil. It is consumed by animals. Infestations on cereal fields may led to refusal of the harvested product by Moroccan seed companies (Tanji, 2005). Clodinafop-propargyl is a systemic herbicide absorbed by leaves to control grasses. It belongs to the Aryloxyphenoxy-propionate 'FOPs' family. It causes inhibition of acetyl CoA carboxylase (ACCase) (Ezzahiri & *al*., 2017). ACCase enzyme catalyzes the fatty-acid synthesis. This herbicide inhibit the ACCase enzyme activity, thus blocking the production of phospholipids necessary for synthesizing the lipid bilayer, which is indispensable for cell structure and function. *Avena sterilis* become is a serious problem in cereal fields in Ouazzan region of Morocco that causes reduction of cereal production. The aim of this study is to compare the effect of three doses of Clodinafop-propargyl on *Avena sterilis* infestation in a soft wheat crop in the Ouazzan region of Morocco.

II. MATERIAL AND METHODS

A weeding trial was conducted in Ouazzane region of Morocco during 2017-2018 growing season. The experimental design was Randomized Complete Block Design (RCBD) with three replications. The distance between the blocks was 2 meters and the distance between plots was 1 meter. Each block contained 4 elementary plots, 3 plots of which were treated with the post-emergence herbicides tested (Table 1) and one untreated control plot. The size of the elementary plots was 2m x 5m (10 m²). Treatments was carried out on January 2, 2018 with a Knapsack herbicide sprayer with nozzle delivering a 3 bar jet. The spray volume per hectare is 200L. Treatments consist on three rates of application of Clodinafop-propargyl (Table 1). Observations were at 60 days after application of herbicides. Observations concerned

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Percentage of *A. sterilis* density reduction and biomass reduction. *A. sterilis* density reduction percentage= [*A. sterilis* density in control plots – *A. sterilis* density in treated plots] x 100 / [*A. sterilis* density in control plots], Calculation of the density at the experimental level of the plot was made by a quadrant of 1m x 1m. *A. sterilis* dry biomass reduction percentage= [*A. sterilis* dry biomass weight in control plots – *A. sterilis* dry biomass weight in treated plots] x 100 / [*A. sterilis* dry biomass weight in control plots]. Calculation of dry *A. sterilis* biomass were made by collecting *A. sterilis* in each plot using a quadrant of 1m x 1m. Samples were dried in a drying oven at 75 ° C for 48 hours. Then, dry plant material in each plot were weighed with a precision balance. Statistical analyzes were performed with IBM SPSS Statistics, version 21.0 using the analysis of variance (ANOVA).The differences among treatment means was compared by Tukey's test at *P*= 0.05.

Table 1: Applied herbicides in experimental site

Herbicide treatments	Herbicide active ingredient	rate of application (g/hectare)
Treatment 1	Clodinafop-propargyl	40 g/ha
Treatment 2	Clodinafop-propargyl	60 g/ha
Treatment 3	Clodinafop-propargyl	80 g/ha

III. RESULTS AND DISCUSSION

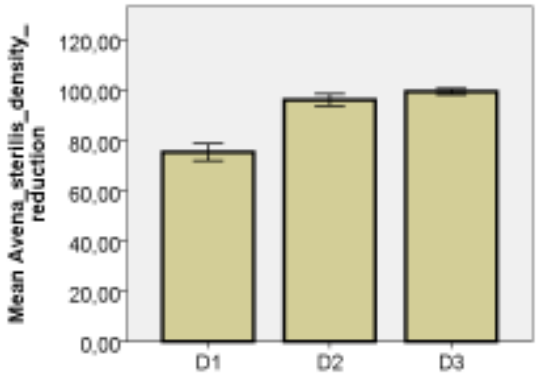
Effect on *A. sterilis* density reduction

Statistical analysis revealed significant differences between treatments (Table 2). Results in Table 2 showed that the best *A. sterilis* density reduction was obtained by Clodinafop-propargyl at 60 g/ha and 80 g/ha recording respectively 96.1% and 99.4% of *A. sterilis* density reduction. Clodinafop-propargyl at 40 g/ha showed lower efficacy 75.3 % of *A. sterilis* density reduction (fig. 1).

Table 2: Effect of treatments on A. sterilis density reduction (%)

Doses	*Avena sterilis* density reduction
Clodinafop-propargyl at 40 g/ha	75.3[a]
Clodinafop-propargyl at 60 g/ha	96.1[b]
Clodinafop-propargyl at 80 g/ha	99.4[b]
Pα = 0.05	<0.001

Significant differences within the same column and means followed by the same letter do not differ at P= 0.05 according to Tukey's test



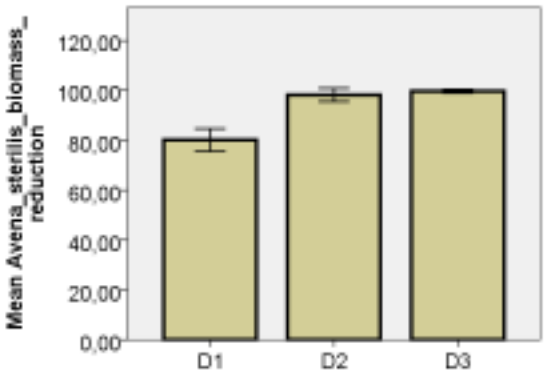
D1: Clodinafop-propargyl at 40 g/ha; D2: Clodinafop-propargyl at 60 g/ha; D3: Clodinafop-propargyl at 80 g/ha
Error Bars: 95% CI

Fig.1: Effect of treatments on A. sterilis density reduction (%)

Table 3: Effect of treatments on A. sterilis dry biomass reduction (%)

Doses	*Avena sterilis* density reduction
Clodinafop-propargyl at 40 g/ha	80.1[a]
Clodinafop-propargyl at 60 g/ha	98.2[b]
Clodinafop-propargyl at 80 g/ha	99.7[b]
Pα = 0.05	<0.001

Significant differences within the same column and means followed by the same letter do not differ at P= 0.05 according to Tukey's test



D1: Clodinafop-propargyl at 40 g/ha; D2: Clodinafop-propargyl at 60 g/ha; D3: Clodinafop-propargyl at 80 g/ha
Error Bars: 95% CI

Fig.2: Effect of treatments on A. sterilis dry biomass reduction (%)

Effect on *A. sterilis* dry biomass reduction

Statistical analysis revealed significant differences between treatments (Table 3). Data in Table 3 indicate that the best *A. sterilis* dry biomass reduction was achieved by

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Clodinafop-propargyl at 60 g/ha and 80 g/ha recording respectively 98.2 % and 99.7% of *A. sterilis* dry biomass reduction. Concerning the effect of Clodinafop-propargyl at 40 g/ha, results showed lower efficacy that did not exceed 80.1% of *A. sterilis* dry biomass reduction (fig. 2).

IV. CONCLUSION

This study has shown that the herbicide Clodinafop-propargyl at 60 g/ha and 80 g/ha gave the best control of *A. sterilis*. Clodinafop-propargyl at 40 g/ha lower control of *A. sterilis*. Thus, Clodinafop-propargyl at 60 g/ha can be recommended to farmers in Ouazzane region when *A. sterilis* infestation is dominant. This study should be completed with the assessment of Clodinafop-propargyl effect on other problematic grasses.

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