Efficacy of Post-emergence Herbicides Applied at Reduced Doses on Weeds in Durum Wheat (*Triticum durum* L.) in Central Greece

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Abstract. A field experiment was conducted to determine the effects of post-emergence herbicides applied at the recommended and reduced doses on weeds in durum wheat. A randomized complete block design was employed with 4 replications per treatment. Weed density differed significantly among the herbicide treatments. Our results show that the herbicides could effectively control *A. sterilis*, *A. myosuroides* and *G. aparine* when their doses were reduced by 15%. The herbicides pyroxsulam and mesosulfuron-methyl+iodosulfuron-methyl-sodium showed some difficulties in controlling *S. arvensis* even at the labeled recommended dose.

Keywords: dose reduction, herbicides, control, weeds, wheat.

Introduction. Research studies have indicated that there is good potential to utilize reduced herbicide doses within a competitive cropping system (i.e. competitive cultivars, higher crop seed rates and reduced row spacing) (Blackshaw *et al.*, 2006). Travlos (2012) also reported that the best weed control in wheat crop was achieved with the highest herbicide rate, but lower rates of mesosulfuron+iodosulfuron often provided adequate weed control.

Aims and objectives. The aim of this study was to determine the effects of post-emergence herbicides applied at the recommended and reduced doses on *Avena sterilis*, *Alopecurus myosuroides*, *Galium aparine* and *Sinapis arvensis* population reduction, on photosynthetic rate and seed yield of wheat crop.

Materials and methods. Field experiment was carried out in central Greece (Domokos, 230 km from Athens, 22.33 E and 39.03 N) in 2013-2014. This study was supported by Research Committee of

University of Thessaly. The wheat (*Triticum durum* cv. Quadrato) was sown on 10 November 2013. The post-emergence herbicides pinoxaden (10%) (Axial EC), 2,4 D (45.25%) + florasulam (0.625%) (Mustang EC), pyroxsulam (7.5%) (Senior WG) and mesosulfuron-methyl (3%)+iodosulfuron-methyl-sodium (3%) (Hussar maxx WG) were used in the experiment. The recommended doses of pinoxaden, 2,4 D+florasulam, pyroxsulam and mesosulfuron-methyl+iodosulfuron-methyl-sodium were 400 ml ha⁻¹, 600 ml ha⁻¹, 200 g ha⁻¹ and 200 g ha⁻¹, respectively. The herbicides were applied at wheat tillering (22 March 2014) at the rates of recommended dose (X), 0.85 X and 0.70 X. A randomized complete block design was employed with 4 replications per treatment. The herbicides treatments included untreated control, pinoxaden+2,4D+florasulam (PIN), pyroxsulam (PYR) and mesosulfuron-methyl+iodosulfuron-methyl-sodium (MES) at three doses. The experiment was set up over an area of 600 m². The

Tab. 1. Effect of different herbicides treatments on weed population reduction (%), photosynthetic rate ($\mu\text{mol CO}_2 \text{ m}^{-2}\text{s}^{-1}$) and seed yield (kg ha^{-1}) of wheat crop.

	Control	PIN X	PIN 0.85X	PIN 0.7X	PYR X	PYR 0.85X	PYR 0.7X	MES X	MES 0.85X	MES 0.7X	LSD 5%
<i>A. sterilis</i>	0	90	77	15	86	81	9	88	79	19	9.59
<i>A. myosuroides</i>	0	87	79	9	83	70	12	87	75	13	13.10
<i>G. aparine</i>	0	98	70	13	85	48	6	81	64	11	10.00
<i>S. arvensis</i>	0	85	63	23	73	47	24	45	27	14	19.18
Seed yield	2200	5390	4940	3130	5350	4670	2580	5190	4590	2470	320.9
P. rate	8.84	16.60	15.97	9.80	15.8	15.08	9.18	15.4	9.79	9.39	1.29

plot size was 3 x 5 m. The number of the dominant weeds and the photosynthetic rate of wheat plants were assessed 40 days after herbicides application. The wheat seed yield was determined on 28 June 2014. For analysis of variance and comparisons of means, the software SigmaPlot 12 was used. The LSD test was used to detect and separate the mean treatment differences.

Results and discussion. The main weeds present in the experiment were *Avena sterilis*, *Alopecurus myosuroides*, *Galium aparine* and *Sinapis arvensis*. Weed density differed significantly among the herbicide treatments (Tab. 1). Our results show that the herbicides could effectively control *A. sterilis*, *A. myosuroides* and *G. aparine* when their doses were reduced by 15%. The herbicides pyroxsulam and mesosulfuron-methyl+iodosulfuron-methyl-sodium showed some difficulties in controlling *S. arvensis* even at the labeled recommended dose. Barros *et al.* (2007) also observed that using lower doses than recommended the herbicide mesosulfuron-methyl and iodosulfuron-methyl-sodium controls the annual grass weeds (*A. sterilis* and *Lolium rigidum*)

better than some broad-leaved weeds. Moreover, our results indicated that the lowest seed yield and photosynthetic rate of wheat crop were recorded for weedy control treatment. The wheat seed yield had negative and significant correlation with total weed density ($r=-0.958$, $p<0.001$).

Conclusion. Our results show that the herbicides could effectively control *A. sterilis*, *A. myosuroides* and *G. aparine* when their doses were reduced by 15%. The grain yield and photosynthetic rate of wheat crop decreased when herbicides doses was reduced. The highest seed yield was found in PINX treatment.

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