

# Wild Mustard (*Sinapis arvensis* L.) and Corn Poppy (*Papaver rhoeas* L.) Competition with Four Pea Varieties Cultivated Following Conventional or Organic Farming Practices

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BulletinUASVM Horticulture 72(2) / 2015

Print ISSN 1843-5254, Electronic ISSN 1843-5394

DOI:10.15835/buasvmcn-hort:11633

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## Abstract

A field experiment was carried out to determine the effects of cultural system and pea varieties on weed flora, under Mediterranean conditions. The experiment was laid out in a split-plot design with four replicates having two main plots (conventional and organic farming system) and four sub-plots (pea varieties: Onward (commercial variety), Amorgos, Andros and Schinoussa (local varieties)). Our results indicate that the pea varieties varied in their ability to compete with weeds. The commercial variety Onward showed significantly lower competitive ability against weeds in both cultural systems. Finally, pendimethalin provided 66% and 70% control of *Sinapis arvensis* and *Papaver rhoeas*, respectively.

**Keywords:** *competition, organic, pea, varieties, weed.*

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## Introduction

Field pea is an important grain legume in Europe. Weeds are a major problem in both conventional and organic pea crops. Harker *et al.* (2001) observed that pea yield losses due to weed competition ranged from 40 to 70%. Wild mustard (*Sinapis arvensis* L.) and corn poppy (*Papaver rhoeas* L.) are among the most important broad-leaved weeds in pea and other winter legumes. Appropriate crop and variety selection has the potential to significantly influence the weed density (Bilalis *et al.*, 2009; Efthimiadou *et al.*, 2009) in both organic and conventional cultural systems.

## Aims

The aim of this study was to determine the effects of four pea varieties on wild mustard and

corn poppy density in conventional or organic farming systems.

## Materials and methods

A field experiment was carried out in central Greece (Aliartos, 95 km northwest of Athens) in 2014-15. The pea crop was sown on 20 November 2014. The experiment was laid out in a split-plot design with four replicates having two main plots (conventional and organic farming system) and four sub-plots (pea varieties: Onward (commercial variety), Amorgos, Andros and Schinoussa (local varieties)). The sub-plot size was 10.5 m<sup>2</sup>. On conventional plots, the herbicide pendimethalin (Stomp Aqua 455 CS; BASF, Athens, Greece) was applied pre-emergence at a rate of 1137.5 g a.i./ha<sup>-1</sup>. Moreover, 570 kg ha<sup>-1</sup> of fertilizer (11-15-15, N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) and 7.6 ton ha<sup>-1</sup> of sheep manure

**Tab. 1.** Effects of cultural system (organic and conventional) and pea varieties (Andros, Amorgos, Onward, Schinoussa) on *Sinapis arvensis* and *Papaver rhoeas* density (no m<sup>-2</sup>) at 118 DAS.

Farming System	Varieties			
	<i>Sinapis arvensis</i> density (no m <sup>-2</sup> )			
	Andros	Amorgos	Onward	Schinoussa
Organic	14.38	18.75	30.63	19.38
Conventional	4.38	5.63	11.88	6.25
LSD <sub>5%</sub> system	5.91 (F=23.002***)			
LSD <sub>5%</sub> varieties	8.36 (F=3.188*)			
Farming System	<i>Papaver rhoeas</i> density (no m <sup>-2</sup> )			
	Andros	Amorgos	Onward	Schinoussa
Organic	11.25	15.62	28.12	16.25
Conventional	3.12	6.25	8.75	3.62
LSD <sub>5%</sub> system	4.98 (F=26.212***)			
LSD <sub>5%</sub> varieties	7.05 (F=3.961*)			

Note: The LSD (P = 0.05) for cultural systems and pea varieties are also shown. F-test ratios are from ANOVA. Significant at \*P=0.01 and \*\*\*P = 0.001.

was applied before sowing, in the conventional and organic plots, respectively. Densities of wild mustard and corn poppy were assessed at 118 days after sowing (DAS). Analysis of variance was conducted for all data and differences between means were separated using LSD test at P < 0.05. The statistical analysis was performed with SigmaPlot 12 software (Systat Software Inc., San Jose, CA).

### Results and Discussion

Pea varieties vary widely in their competitive ability (Annicchiarico and Filippi, 2007; Spies *et al.*, 2011). Our results show that the weed density differed significantly between the varieties (Table 1). Comparing the four varieties, it has been found that the 'Andros' variety cultivated under the conventional cultural system had lower corn poppy and wild mustard density. In addition, the highest wild mustard and corn poppy density was recorded in the case of Onward variety. This variety was less competitive with weeds than the local varieties. Frost damage on Onward variety was observed. Moreover, the herbicide pendimethalin could effectively control wild mustard and corn poppy. At 118 DAS, pendimethalin showed high efficacy against weeds probably because of microencapsulated formulation of pendimethalin that was used. The highest density of these competitive weeds was found in organic plots. Finally, in weed measurements, a farming system × varieties interaction was not observed.

### Conclusion

Our results indicate that the pea varieties varied in their ability to compete with weeds. The commercial variety Onward showed significantly lower competitive ability against weeds in both cultural systems. Finally, pendimethalin provided 66% and 70% control of *Sinapis arvensis* and *Papaver rhoeas*, respectively.

*Acknowledgements.* This work was supported by the European Commission within the project 'Enhancing of legumes growing in Europe through sustainable cropping for protein supply for food and feed' (FP7 Research Project N° 613781).

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