HERBICIDE-RESISTANT WEEDS IN CEREAL CROPS IN GREECE
Eleni Kotoula-Syka1, C. Afentouli2 and I. Georgoulas3
1Democritus University of Thrace, Dept. of Agricultural Development, Pantazidou 193, Orestiada 68200; 2Technological, Educational Institution of Thessaloniki; 3National Agricultural Research Foundation, Plant Protection Institute, Thessaloniki, P.O. Box 324, Thermi 570 01, GREECE
(E-mail: kotoulaeleni@yahoo.gr)

INTRODUCTION
In Greece, chlorosulfuron was used for many years to control broad-leaf weeds whereas diclofop-methyl was heavily used for grass weed control in winter cereals. Recently, failures in control of several populations of major weeds were reported.

OBJECTIVES
• To investigate the possibility of resistance evolution in various populations of Papaver rhoeas to chlorosulfuron, and of Lolium rigidum, Phalaris brachystachys and Avena sterilis to grass herbicides
• To elucidate the mechanism of resistance

MATERIALS and METHODS
• Seeds of resistant (R) Papaver rhoeas, Lolium rigidum, Phalaris brachystachys and Avena sterilis were collected from winter wheat fields treated repeatedly for more than five consecutive years with chlorosulfuron, diclofop-methyl, fenoxaprop-ethyl or isoproturon.
• Seeds of susceptible (S) biotypes were collected from fields that had never been treated with herbicides.
• Pot experiments were conducted outdoors and commercial formulations of the herbicides were applied post-emergence at the 3-4 leaf stage.
• Plant growth was evaluated by determining shoot fresh weight per pot.
• The ACCase and ALS extraction and their activity were assayed using the procedures described by Tai et al (1998) and by Ray (1984) respectively.

RESULTS
A population of P. rhoeas was found to be resistant to chlorosulfuron (altered target site). However, all P. rhoeas populations were susceptible to imazapyr and tolerant to imazapyr, but R plants were cross-resistant to imazapyr.

Table 1. Response of resistant (R) and susceptible (S) biotypes of P. rhoeas to chlorosulfuron applied following pretreatment with different rates of malathion.

<table>
<thead>
<tr>
<th>Malathion (g a.i/ha)</th>
<th>Chlorosulfuron ED50 (g a.i/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>S</td>
</tr>
<tr>
<td>62.5</td>
<td>S</td>
</tr>
<tr>
<td>200</td>
<td>S</td>
</tr>
<tr>
<td>1000</td>
<td>S</td>
</tr>
</tbody>
</table>

CONCLUSIONS
• Control of R. P. rhoeas and P. brachystachys is still possible using alternative selective herbicides.
• Imazapyr-resistant A. sterilis could be controlled by ACCase inhibitors.
• Selective control of multiple-resistant L. rigidum in cereal crops with ACCase and ALS inhibitors is a difficult task, due to the unpredictable and inconsistent pattern found among the unpredicted and inconsistent pattern found among the unpredicted and inconsistent pattern found among
• Integrated strategies based on crop and herbicide rotation, and cultural weed control practices, are required.

Continuous use of isoproturon resulted in heavy infestation with A. sterilis that tolerated high rates of isoproturon while being susceptible to ACCase inhibitors used.

Eight biotypes of P. brachystachys, were examined for resistance to ACCase inhibitors and seven of them indicated resistance to fenoxaprop-ethyl. In contrast all eight biotypes were susceptible to trikecyldim and clodinafop-propargyl.