

# Long-Lasting Study of Fungicide Efficacy against Czech Cucurbit Downy Mildew Populations

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## INTRODUCTION

In Europe including the Czech Republic (CR), *Pseudoperonospora cubensis* [(Berkeley & MA Curtis) Rostovzev] (PC), the causal agent of cucurbit downy mildew has been reported repeatedly on cucumbers since approximately 1985 (Lebeda & Cohen 2012). The major site-specific fungicides used against PC are from four chemical classes: Qols, PAs, CAAs and cyanoacetamide oximes. Smaller market shares are taken by phosphonates, dinitroanilines, carbamates and plant defense inducers (Gisi & Sierotzki 2008). PC belongs to the 10 highest risk pathogens with developing resistance quite quickly to key fungicides (Lebeda & Cohen 2012). From 2005 to 2011 our research was focused on screening efficacy of fungicides with various active ingredients to Czech PC populations and compared with previous results. Since 2012 it has been concentrated on testing new fungicide groups and continued monitoring of cymoxanil, metalaxyl-M and dimethomorph.

## MATERIAL AND METHODS

159 Czech PC isolates (2005-2011) and 52 (2012- 2014) were screened using the floating leaf disc bioassay. Highly susceptible *Cucumis sativus* cv. Marketer 430 was used for preparation of leaf discs. From 2005 to 2011, there were screened (fosetyl-AL, propamocarb, metalaxyl, metalaxyl-M, cymoxanil, dimethomorph) with five concentrations and from 2012 to 2014 (fluopicolide, propamocarb-hydrochloride, azoxystrobin, cymoxanil, dimethomorph, metalaxyl-M) with three concentrations. Pathogen evaluation was conducted by Lebeda & Urban (2010). The total degree of infection (DI) for each isolate was calculated by Townsend & Heuberger (1943). Three reaction types were assigned: sensitive (DI = 0-10%), moderately resistant (DI = 10.1-34.9%), resistant (DI =  $\geq$  35%).

## RESULTS AND DISCUSSION

Efficacy of screened fungicides towards PC isolates varied significantly from 2005 to 2011. Fosetyl-AI and propamocarb were highly effective whereas metalaxyl and metalaxyl-M were ineffective. Cymoxanil showed a very low efficacy except the year 2009. There was recorded a temporal shift towards higher sensitivity on all dimethomorph concentrations in Czech PC populations. In the case of fosetyl-AI, propamocarb and metalaxyl our results verified our previous experiments (Urban & Lebeda 2007) from CR (2001-2004) and confirm the trend noted in PC populations in whole central Europe (Lebeda & Cohen 2012). Results from 2005 to 2010 have been comprehensively composed by Pavelková et al. (2014). Data from 2011 has not been published yet. From 2012 to 2014, efficacy of fungicides against Czech PC populations varied significantly. Cymoxanil was ineffective that verified results from 2005 to 2011. Dimethomorph was highly effective that reflected a temporal shift towards higher sensitivity in previous years. Metalaxyl-M showed high efficacy in contrast to the results till the year 2009. Fluopicolide with propamocarb-hydrochloride was 100% effective in contrast to very low azoxystrobin efficacy. There has been available no data about Czech PC populations resistance to these fungicides since 2011.

## ACKNOWLEDGEMENTS

This research was supported by MSM 6198959215; QH 71229; NPGZ-M/03-023; IGA 2016-001.

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